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COMPETITIVENESS CHALLENGE FACING THE U.S. INDUSTRY

HEARING

BEFORE THE

COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION UNITED STATES SENATE

ONE HUNDRED FIRST CONGRESS

SECOND SESSION

ON

THE COMPETITIVENESS CHALLENGE FACING THE U.S. INDUSTRY

MAY 11 AND 23, 1990

Printed for the use of the
Committee on Commerce, Science, and Transportation

U.S. GOVERNMENT PRINTING OFFICE

31-736 O WASHINGTON : 1990

For sale by the Superintendent of Documents, Congressional Sales Office
U.S. Government Printing Office, Washington, DC 20402

S261-72

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COMPETITIVENESS CHALLENGE FACING U.S. INDUSTRY

FRIDAY, MAY 11, 1990

U.S. SENATE,
COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION,
Washington, DC.

The committee met, pursuant to notice, at 9:15 a.m., in room SR-253, Russell Senate Office Building, Hon. Ernest F. Hollings (Chairman of the Committee) presiding.

Staff members assigned to this hearing: Pat Windham, professional staff member; Loretta Dunn, staff counsel; and Fiona Branton, minority staff counsel.

OPENING STATEMENT BY THE CHAIRMAN

The CHAIRMAN. The committee will please come to order.

I welcome our panel of witnesses to this hearing on the competitive challenge facing the United States. No problem we face—and we face many—holds more peril to our future than the continued failure of the United States Government to compete in the global economic contest. In calendar year 1989, the United States suffered a trade deficit of $108.6 billion, and this year that will rise easily, unless we sober up and straighten out our Government's twisted sense of priorities. Just as surely as $100 to $200 billion budget deficits have busted the Federal Government, our gigantic trade deficits are breaking the economy. Indeed, this Nation of once huge trade surpluses—this country of Yankee traders, hard bargaining, and world commerce—has become the largest debtor in the world; we owe everyone else! If these other investing countries decide to pull the plug on America and take elsewhere the billions they have invested here, we would be washed right down the money drain.

There is no mystery as to the cause of our trade malady. Oh, some will tell you that it is because other countries have surpassed the American worker in productivity. That is profoundly false. The Bureau of Labor Statistics and the Chamber of Commerce both agree that the American worker is still the most productive worker in the world. While the rates of increase here the past few years have lagged behind increases elsewhere, in absolute terms we are still ahead in the productivity index. Others will argue that we lack the research and technology and that this is where America fails. While it is true we have exported much of our expertise, America still has the lead in creativity and research. Nor is our problem a lack of competitive zeal among our business leaders and their employees. American industry has been retooling, moderniz-

ing, finding new ways to compete. Unfortunately, for want of encouragement to produce here at home, many have taken this know-how, and the jobs it produces, offshore. This has been done, not because they are unpatriotic, but because they are denied the help of their Government in the international trade competition.

This is the nub of the problem. All around our world, countries are throwing their resources into taking over America's markets and picking off America's jobs. Governments everywhere work with business people to give them the advantage. They erect every sort of barrier imaginable—structural, legal, institutional—to keep our products out of their markets, and they confer on their producers every advantage imaginable to corner our markets.

While other nations are down on the field competing for jobs, dollars, and markets, America sits up in the stands with our leadders caterwauling "free trade, protectionism, free trade, protectionism" as if the world had not moved on since the turn of the century. Their debate is as remote from the realities of today's world competition as the clipper ship is to the world of modern commerce. For in truth, what is at issue here is simple and stark: at issue are our jobs, our standard of living, our national security.

I thank our distinguished witnesses for agreeing to appear before this Committee, and I look forward to hearing from them.

Mr. Prestowitz is under some pressure to leave here momentarily. We want to hear from him and ask what questions we can in the limited time, and get in depth with the other two experts.

I have watched as a layperson over the years and testified myself back in the 1950s before the old Tariff Commission. We as politicians were necessarily worried about jobs, now we are worried about the country. The so-called trade war was feared back in the Smoot-Hawley days, when we only had 1 percent of our GNP, now it is nearer 18 percent.

And if anybody thinks a war is going to be started by anything we do, let them be informed that the war is in full course and in the fourth quarter. We have set the example and the others have improved upon the example with the use of their government. And it is succeeding.

And it nettles me to have our representatives in the United States constantly going to Japan crying, let's be fair, be fair. Trade is economic. Market forces operate, and when we make it in the economic interests of the Japanese, they will deal. We know as politicians a deal is a deal. And if I were the emperor in the next 10 minutes, I would not change a thing unless it was in my economic interest.

So, we look around and find out it is we who are disorganized. I never bash Japan. I bash the United States for its stupidity, its blindness on this score, its lack or organization, and its failure to enforce. We at the congressional level are constantly passing a little law here and a little law there and a little law again in another session, and hail it as an omnibus trade bill or super this or emergency that and all that nonsense. And we do not have a policy. And what we have is a lack of enforcement.

If I went over there as the President in the next 10 minutes and got any one of you three to head up not a national security council, but a national trade council and brought in every one of the enti-

ties, Commerce, State, Defense, Treasury, Agriculture, 28 different departments and agencies into a national trade council. And if I said, Mr. Hughes, Mr. Prestowitz, Mr. Choate, you now are the director of our economic security, and let's start coordinating and find out what is the consummate policy of this country. More particularly just start enforcing the dumping laws and the other procedures that are on the books, it would, over a three to four year period, shake down into a pretty good trade policy.

But we need you folks to wake us up. It was Hutchins years ago in Chicago who said the purpose of education was to unsettle the mind and inflame the intellect.

I have been reading all three of you. You are now on the defensive. I noticed that in U.S. News and World Report.

But in any event, you do not have to be defensive. You have to get on the offensive to get this crowd's attention up here, and we appreciate your being with us this morning.

Senator Rockefeller.

OPENING STATEMENT BY SENATOR ROCKEFELLER

Senator ROCKEFELLER. Mr. Chairman, I agree with everything you said. That was "U.S. News" and "World Report," and I think it is fascinating that the word "Japan basher" has now been replaced by the word "revisionist" which I guess is better because I am not totally sure what a revisionist is. It implies that one is looking backwards, which I think is not what these particular four gentlemen from America want to be known as. I think they want to be known as looking forward, but nevertheless it is better than Japan bashing. I totally agree with what you said.

I do not even have the heart to repeat the quote that John Young gave us six years ago. I was just barely in the Senate then, and we had this congressional competitiveness council headed up by Jeff Bingaman, and we were responding to John Young's challenge. And he was telling us at that time if we do not reverse what we are doing, we are going to have a lower standard of living and fewer opportunities for our people. And that was six years ago.

I agree with you. We pass little bills and little things. I have a passionate commitment to the Japanese Patent Office, and I often delude myself sometimes into thinking that the tougher I get—and we got Carla Hills to take it up and they agreed to add a few more people. And they have got a big, new building in downtown Tokyo, and everything is going wonderful, except it still takes six, seven years to get a patent.

You pass a bill or you pass a resolution or something, and you think that America is catching on, and we're not. In fact, I think what we are coming to be is accustomed to being compared to other countries, and we are accustomed to being told that we are the ones who are falling short. And we see this in our test scores, in our civilian R&D and our plant and equipment.

The problem is that although Americans may be more conscious of our deficiencies, and brutally conscious of our deficiencies, we as a nation are simply not mobilizing because of our sustained John Wayne complex which you, Mr. Prestowitz, talk about extensively, this sort of Lone Ranger concept that if you do not do it by yourself

and you are not riding off into the sunset against all of these risks and doing it by yourself, not in concert with society, not necessarily in the national interest, but in the personal interest, and that is what made this country great. We don't pay attention that much anymore.

So, I hope that once again that you three will try to shake us up and let us know if there is any good news.

I do not mean to suggest by this that Japan is doing what it ought to be doing. It is not. Its markets are still insufficiently open. Homogeneity is an incredible advantage to them and an incredible disadvantage to others because it establishes cultural patterns which are extraordinary.

Again, Mr. Prestowitz points out that back in the days that the Dutch were at what is now Deshima, it was then Nagasaki, was that anytime a Japanese fisherman was rescued by a foreign vessel, he was not allowed to come back to Japan. Now, this was before the major restoration, but the Japanese immediately after that—Perry came in in 1953 and, again as Clyde said, created the great first market-opening package. He said you people better open up or we are going to level the country, and they did. They opened up Shimoda, and that was helpful. And very, very, very helpful, they opened up Hakodate, which is way up in the northern part of the country. In other words, that was their first market-opening package. And they have been strategically planning since then.

I do not think the President understands this. I am not sure that the country wants to understands this or wants to respond to this. And I hope I am wrong, and I will end my statement.

The CHAIRMAN. We apologize to the panel because we have a NATO conference in Paris, and a lot of our quorum has gone to Paris. That is unfortunate.

Senator ROCKEFELLER. I rather thought it was a distinguished panel we had here, Mr. Chairman.

The CHAIRMAN. I thought I ought to explain that to you because they will be coming back and they are wanting to know this record.

Mr. Prestowitz, let's start off with you and hear from you, sir.

STATEMENT OF CLYDE PRESTOWITZ, PRESIDENT, ECONOMIC STRATEGY INSTITUTE

Mr. PRESTOWITZ. Thank you, Mr. Chairman.

Recently the "Wall Street Journal" held an international forum in which they gathered a number of present and ex-leaders. And the question discussed was which country will be number one in the 1990s and the 21st century. Among those participating were former Prime Minister Nakasone of Japan, former President Giscard d'Estaing of France, Felix Rohatyn, the financier from New York, and a number of other distinguished people from Asia and Europe.

And I was struck by the response. Mr. Kenichi Omae from Japan said that in the 21st century Japan would be number one and the U.S. would be tied for number two with Europe. President Giscard d'Estaing said that if you ask him about the 1990s, the United States will be the leader, but that in the 21st century, it would be

Europe and Japan contending for the lead, and the United States bringing up the rear.

Shortly thereafter there was a television program in Paris on which the president of France appeared with Mr. Brzezinski, our former national security advisor, and the question again was which country will be number one in the 21st century. The president of France responded and said that Europe would be first, Japan would be second, and the United States would be third.

I think one of the interesting things about our present situation is that we in the United States are living in kind of a dream world of the past. We tell ourselves we are the envy of the world. We tell ourselves it is morning in America. We talk about the great American job machine.

But if you travel to Tokyo or Seoul or Taipei or Hong Kong or Paris or Bonn or Zurich, the questions that are asked again and again to Americans is, "What is the matter with you. Don't you understand what is happening? Why don't you Americans get it together?" And the truth is that our economic position relative to that of our leading competitors is eroding day by day.

We have hailed, and rightfully so, the end of the cold war. We have seen, and rightfully so, the end of the Soviet empire as justification for American policies of the past 40 years. But what we have failed to recognize is that we are moving into a new era, and in the new era, America will face unprecedented challenges. National security will be defined in geoeconomic terms rather than geopolitical terms, and we will face these challenges without the benefit of our past superiority in industry, technology and finance. We will face more acutely the problem that much of our current economic policy, both domestically and internationally, is based upon outmoded premises and concepts, and we will be faced with the necessity at least of revising those, and, perhaps more likely, developing a new approach or a new strategy.

This year Japan will invest twice as much as the United States in absolute terms. On a per capita basis, Japan will invest more than twice as much as the United States.

We hear criticisms—and they are justified—of poor American quality. We hear criticism of the short-term orientation in American business, and all that is true. But I contend that it is very difficult to make high quality products with worn-out tools. And this year every Japanese worker is going to get twice as many new tools as every American worker. And the same is true in Korea, in Taiwan and elsewhere in Asia, and the same is true in Germany and in much of Europe.

The U.S. has been pursuing policy with regard to the outside world based on the premise that the rest of the world shares our system. The underlying assumption is that the Japanese, the Koreans, the Europeans, and others share our economic principles and economic objectives, that they operate their economies in more or less the same way. And the truth is that they do not. The truth is that the overwhelming American power of the past 40 years has masked many very important fundamental dissimilarities. And I think we can summarize it this way if we make a comparison with Japan or Korea or with Germany.

In the U.S. we focus the attention of our economic policy on the consumer and on consumption, and the objective of our policies is to raise consumption in the most direct and fastest way possible. We fear concentrations of economic power. We regulate them. We break them up. We do not believe in industrial policy. Everybody knows that bureaucrats, at least American bureaucrats, cannot pick winners and losers. They can only pick losers.

We think of trade as a policy unrelated to our other policies. We have a trade policy that is made in kind of a vacuum and on the basis, essentially, of laissez faire. In fact, in a few minutes I am going to go into a debate with a former chairman of the Council of Economic Advisers. And his position will be that dumping is good for American consumers, that if the foreign exporters are so foolish as to sell below cost in the American market, that is a gift to consumers. We should take the gift. And if that drives us out of the semiconductor business, that is fine because we can take the cheap semiconductors and our workers can go make wood chips or grow soybeans or cut down trees or something else more productive to gain their livelihood.

Now, if we compare that with the approach taken by our leading competitors, both the Japanese and the Koreans and the Germans and others focus upon production. They want to raise living standards, too, but they want to do it by producing more. They promote concentrations of corporate and economic power. The keiretsu of Japan, the Sumitomo group, the Mitsubishi group, the large bank groups of Germany, the Daimler Benz group, the large government-backed groups of France are all the result of policies aimed at promoting very substantial, large, powerful groups that have the power to invest for the long term, that have the power to go for market share rather than for quarterly earnings.

Thirdly, most of our leading competitors believe in industrial policy. They believe that the government has not only a right, but a duty to guide the economy toward higher levels of value added and higher levels of technology, and they do that.

And finally, they look upon trade as a strategic matter. The Japanese, in particular, apply the same effort in trade negotiations that we apply in negotiating with the Soviets over arms control. To the Japanese, trade is national security, and that gives the issue a wholly different cast than in the United States.

Now, obviously, the question is, "What are the consequences of all this?" And the answer is very simple. The United States is suffering and will continue to suffer an erosion of its ability to take independent action. We are increasingly heavily dependent on outsiders both for finance and for technology. Those outsiders are often our allies, but their interests do not always coincide with ours. And we are casting our future into the hands of people who, while friends and allies, are also competitors and whose long-term interests may diverge from ours.

We are making it very difficult to maintain for the future the promise of higher standards of living for Americans. It is going to be very difficult to rebuild our disastrous school system, to rebuild the crumbling infrastructure, and to maintain the excellence of our universities with a declining, stumbling, second rate economic base.

The way to get around this, of course, is complicated, but I think that there are two key points that should be made.

One is that the real problem for the United States is not the matter of means. We have both the material and the human resources to achieve preeminence, to match the standards of excellence that we achieved in the past. Our problem is really one of will. I have no doubt in my mind that if we made a national decision, as we did, say, to go to the moon, if we made a decision to achieve preeminence in any particular field, that we can do it. I do not believe it is the case that Americans cannot work together. We have seen proof in endeavors such as the Apollo project, we have seen it in the history of the NACA, which preceded NASA, and we have seen it in the wars that we have fought, that the United States knows how to run a productive economy when it decides to do so.

Our problem is that we have not yet decided to do so. We are divided among ourselves, and we lack a leadership which is prepared to go to the American people and tell them and to challenge them. I know from my travels around the country and my own speaking around the country that the people are ahead of their leaders. It is often said to me that you cannot ask Americans to sacrifice. Look what happened to Dukakis. Look what happened to Mondale. I do not believe that for a moment. I believe it depends on what you ask Americans to sacrifice for. And I think that if our leadership took the position that the U.S. is confronting truly fundamental questions, that we need to face up to them and to strive and to make the sacrifices necessary to achieve a secure future for posterity, that Americans would respond.

The second major point I would like to make is this. In our dealings with Japan, in particular, and with many other nations on trade issues, because we assume that they share our objectives and our system and our principles, the thrust of our policy is to attempt to make them resemble us. Our injunction to them to open, our plea with Japan to open its market is based on the premise that Japan knows what "open" means, that it can open, and that it should open.

I suggest that this premise is false. And I do not suggest that in a pejorative way. I do not believe that the Japanese are unfair. I do not believe that Japan is cheating. I believe that Japan and Korea and Taiwan and Germany are pursuing a different system. And I think that the United States should concentrate much less on trying to make everybody else resemble us and much more on figuring out what is it that we want.

I do not think we can change the Japanese economy. I am not sure that we should try. What we can do is to change our own, and I believe that is where we should put our efforts.

Thank you.

The CHAIRMAN. Mr. Prestowitz, you have to leave at 10:00 or 10:15?

Mr. PRESTOWITZ. Yes, about 10:05.

The CHAIRMAN. I want to make sure our colleagues have a chance to ask questions. So, we will hold up Mr. Hughes and Mr. Choate.

We think the Japanese should be grateful for our help in rebuilding their country after World War II. But they are going to live their way. But what we are saying really in all this trade nonsense is why don't you show some gratitude. We are still paying for your defense and we rebuilt you. We are in a way trying to take credit for their wonderful economic success and feel they should show more gratitude. I do not think we should be trying to change their way because we do not understand the competition.

They are using their government for market share. We are using our government for standard of living.

I can tell you before you can do anything, I do not care what your capacity is, we have a minimum wage. We invade the free market. We say you have to have Social Security, unemployment compensation, safe working place, safe machinery, clean air, clean water, all of these things, parental leave, plant closing notice. You put it out on the floor, we are going to vote for it because we do not understand the cost of it to our competitiveness.

Now, you cannot breathe in Tokyo, and that does not worry them. That is all we are worried about. And if we are really going to get competitive, quit berating the U.S. industrial worker because he is still the most productive in the world. Let's berate the government.

We have industrial policy. Oh, yes, the best industrial policy is our agricultural policy, which is our pride. And that is all government operated. We are going to have a farm bill. If you do not think we have a governmental policy for America's greatest success, come up here in about a month's time. We will have it on the floor. You will hear it. It costs $17 billion.

We have it with respect to maritime, cargo preference. All countries have that.

We have had initiatives with respect to our investment in defense and spinoff into semiconductors, but then we did not follow through because they have dumped. And we said to ourselves that it was smart to let them dump a little because we are rebuilding them, they will be so grateful, and they will help us.

They are not rebuilding to be like us. Rather, we have to understand the competition. Isn't that the case? We do not understand that competition.

Mr. PRESTOWITZ. I agree with that, Senator. I think that this last round of trade talks is the best example of that. We are proceeding on premise about the nature of the structure and the kind of economy that our trading partners have that is entirely different from what they do have. They understand their own system in much different terms than we do.

The CHAIRMAN. You see that approach worked fine after World War II, with the Marshall Plan. They have become capitalistic.

Don Kendall now understands it. He was on the other side during the 1950s, he had the Emergency Committee for American Trade, ECAT, because he was shipping extract and giving me a fit about textiles. Now he is almost out of business, and he has changed around and said we have to get competitive.

I put in a textile bill. They call it protectionist, but they are so dumb up here, they do not understand. I am protecting the foreign producer. In my bill I am guaranteeing the foreign producer the

majority of the business, and the only reason I do it is I am trying to hold on. I have had a net 11 percent increase in imports each year for the past 10 years. That trend is on the acceleration. If that trend continues, rather than 60 percent of the clothing in this room, 92 percent of it will be represented in imports.

So, in this international competition, there have to be some policies that hold at least formative industries within the country. A productive capacity is a matter of policy, don't you think?

Mr. PRESTOWITZ. Well, I think one of the real flaws in our economic policy is that we do not consider at all the question of the structure of our domestic economy with the composition of our trade. So, for example, Michael Boskin, the Chairman of the Council of Economic Advisers, has been heard to say, "Potato chips, semiconductor chips, what's the difference? They're all chips." A hundred dollars worth of potato chips, a hundred dollars worth of semiconductor chips. It's all $100.

The premise of our trade policy is that, as I said earlier, if another nation has an industrial policy which subsidizes a particular industry, if there is dumping or predatory trade activity in the U.S. in that particular market, not to worry. This is a gift to American consumers and we will shift our productive resources into some other industry.

Now, the assumption behind all of that is that it doesn't matter what type of products we make. You can easily shift your resources from making airplanes to making potato chips, and making potato chips brings the same benefits to the economy as making airplanes. If you accept that line of thought, then the policy of the U.S. government is a correct policy. But there are many, myself among them, who believe that there are some advantages to making semiconductor chips and airplanes that do not accrue to making potato chips.

And a terrible weakness of the U.S. government is that we have no analysis. We have no basis for even thinking about what kind of an industrial-commercial structure would be the optimum, the most desirable for the United States. And because we do not have any way of thinking about that, our trade negotiators have no way to establish priorities. When we send our trade negotiator out to open markets, we are just as apt to ask to open the market for clothespins as we are to open the market for supercomputers because we do not have a basis for determining that one may be more important than the other. And until we come down to this issue, we will never get to the heart of the trade question and the heart of the competitiveness question. Trade friction and the loss of U.S. competitiveness do not arise from the size of the trade deficit. They arise from the erosion of American capability in particular, critical industrial sectors, and we have no way of analyzing that. Until we do, we will not solve the problem.

The CHAIRMAN. I am going to yield. Senator Rockefeller.

Senator ROCKEFELLER. Mr. Chairman, I will say a couple of things and ask a couple of questions of Mr. Prestowitz.

It was to me absolutely fascinating two days ago I think it was that the stock market, which may be wholly irrelevant, was way down until three minutes before the closing bell. The Japanese decided to buy the bonds that the treasury was selling. And in a

sense, to the extent that you equate the stock market to American health economically, it is an extraordinary statement. Had to wait until the Japanese decided at the very last moment to come in and the rate was 8.8. The liked it, they bought, and the stock market ended up zero.

I so agree with you about picking on things that do not matter. I remember I was in Korea a couple of years ago. We were in the middle of this extraordinary, sort of ballistic back and forth over photograph albums. And it was a $10 million item. In other words, if we won, whoever produces photograph albums in this country would have gotten $10 million. Now, that is different than if the Koreans, as they had used to, it was a federal offense if you had an American cigarette, a foreign cigarette. That is a different matter. But we do not prioritize.

On the other hand, it is an American characteristic to prioritize in some ways. For example, we are consolidating enormously through the merger process and leveraged buyout now. We are doing it for very different reasons. But it is not to say that we are afraid of losing our Lone Ranger capacity because economic forces force us out of it, and my business is taken over by your business, and I am out and so that is the way the market works. So, that is kind of realistic although not entirely, in some cases, healthy.

When you talk about potato chips and computer chips, that really is not an American characteristic. Let's say that the chairman of the council of Beryl Sprinkle or whoever it was—I don't know—says that one is the same as the other. That is not indicative of how I see America. America operates in its self-interest. We have always tried to do that. That is an American instinct. And yet, you come to this very basic thing that somehow if have to put something called an industrial policy in there or that you have to say these particular industries we need to have, then there is a national humiliation because it implies that the corporate ego is struck or that somehow the national planning is not working or the free market system is not working.

Two questions for you. Why is it so difficult for us, a realistic people—granted, we have too big a market, so we have never had to understand other countries the way we should. But we are getting better. People are studying foreign languages much more, including Japanese. It is vastly improving.

Why is it so difficult for our leaders, our Ph.D.s, our economists, our political leaders, to understand that having certain kinds of industries is fundamental to our entire economic future?

And second, list for us, if you would, what you consider about 10 of those strategic industries should be. And why is it so hard for us to deal with that, for the American psyche?

Mr. PRESTOWITZ. Well, let me start at the back. I think that an initial list is pretty easy. If you take industries like supercomputers, semiconductors, semiconductor equipment, telecommunications, biotechnology, advanced ceramics, I think most people would agree that those industries are going to be the leading, key, fundamental industries in the future.

But I would also add to that automobiles, steel, machine tools, castings, forgings, some of the more mundane industries. I do not mean to say mundane, but industries that we think of as being

older, more mature industries. The reason I add those is—and this is something that is not well understood in American economics and is rarely studied—that the linkage between industries is just as important as, in many cases more important than, the health of a single industry.

For example, we think of the auto industry as being an old rust belt, smoke stack industry. And some people who would say that, yes, we should have a semiconductor industry are less concerned about the health of the auto industry. But what is not remembered is that automobiles use semiconductors, and that automobile plants use computers and robots and lasers. If you want to have a healthy semiconductor industry, they have to sell to somebody. And it is very difficult to maintain a healthy computer or ceramic or telecommunications industry unless you have the rest of an industrial base to sell into.

Now, international economic theory says you do not have to worry about the rest of the industrial base because if you do not have an auto industry, that is okay. Japan and Europe will. And your semiconductor producers can sell to the Japanese or to the European auto industry. But in practice, it does not work exactly that way. It turns out to be much more difficult to sell semiconductors to Toyota than it is to sell them to Ford or Chrysler. And that is true I think throughout the world. There is an understandable proclivity for dealing with people that are closer and that you have dealt with for a long time.

So, I think we need to be really concerned about the totality of the industrial base, and to look at the linkages that exist between those industries that we think of as industries of the future and those industries that we sometimes too facilely dismiss as the industries of the past.

Why do we find it so difficult to do this? Senator, if I really knew the answer to that, I would have written a book about it. It baffles me sometimes, but here are some of the things that I use to explain it to myself.

One is that Americans hate government. Liberty and freedom and individuality, of course, are the core values. And we hate government. We hate bureaucrats. You can always get a laugh from an audience by making some derogatory comment about the bureaucrats in Washington. And as soon as you begin to think about analysis of the industrial base, that raises in people's minds kind of a horrible concept of government bureaucrats crawling over everything.

Now, as Senator Hollings said, the schizophrenia that exists is incredible because we have a farm policy. We have an Agricultural Extension Service, Commodity Credit Corporation, Farm Home Loan Association, Rural Electrification. We really do have an industrial policy in farming.

I was in Chicago yesterday driving up along the lake and looking at all the nice houses. And, boy, we have a fantastic housing stock in this country. And it is no accident because we have a housing policy. We have a Fannie Mae and a Ginnie Mae, and we all write off our mortgage interest against our taxes, and by golly, we are good in housing.

And we still take pride when the shuttle goes up and launches the Hubble telescope. And that is no accident because we have an aerospace policy.

And what is even fascinating to me is that not too long ago on successive days one leading member of the administration says that we do not want an industrial policy in this country. We do not want to pick winners and losers, by golly. No, sirree, Bob. Not in this country. And the very next day, the Vice President, who chairs the Space Council, said that we had to maintain leadership in space. We had to go to Mars in the decade of the 1990s in order to maintain our leadership in space. And it did not click apparently with the Vice President or anybody in the administration that that is an industrial policy, and that is picking a winner.

If we call it national defense, if we call it national security, if we call it agriculture or space, then we can do an awful lot of things. Or if we call it the environment, if call it CAFE, the automobile mileage requirements, if we give it those labels, we can do all kinds of things. But if we talk about analyzing an industrial base, we have a hard time doing it. And it has something to do with fear of central planning.

The second problem is that the whole thrust of U.S. post-war policy has been in the direction of creating a kind of universal system. The idea of free trade was that we were going to tie the other countries of the world into the free economic system, hoping thereby to tie them into the free political system and to create a world of democratic, capitalistic, market-oriented societies. That was a noble vision, and to a significant extent we have realized that vision. I do not think that we should cast it out entirely.

But part and parcel of that was, of course, this American notion of free trade, and the conflict that it creates in this regard. If you do not take any concern for the sectoral composition of your economy, if you do not care about potato chips versus semiconductor chips, then free trade policies are wonderful. And you can engage in them with equanimity because even if the other guy subsidizes his supercomputer industry, that does not bother you.

The difficulty is that if you begin to think that you really ought to have a supercomputer capability or an aircraft industry, you then have to be concerned about the other guy's industrial policies and trade policies. But the minute you do that, if Japan or, let's say, the Europeans, subsidize the airbus if you are concerned for the health of your own aircraft industry, you then get drawn into responding to their industrial policy. And the moment you get drawn into that, you get drawn away from free trade toward some kind of trade management.

And so, any concern with industrial policy, any concern with the composition of your domestic economy, its structure, its sectoral viability, leads you away from American free trade doctrine. And if you get led away from American free trade doctrine, you begin to get led away from the universalist American vision of the post-war world. And, of course, there is a tremendous investment in that vision and a tremendous investment in American free trade doctrine. And so, many of our leaders in academia and business and government shy away from that and cling to what I think are outmoded concepts of the past.

The CHAIRMAN. Hold it there a minute because the witness under our agreement had to be excused at 10:05. Senator Kasten, we have just a little bit of time for quick questions.

Senator KASTEN. Mr. Chairman, first of all, let me commend you on these hearings. If I understand it, we are asking Mr. Prestowitz questions and the rest of the panel is going to——

The CHAIRMAN. Yes.

Senator KASTEN. I did not hear the beginning of your testimony, but one of the points that I wanted to ask each of you is with regard to foreign aid and with regard to financing and different kinds of aid, such as the Ex-Im Bank, OPIC, whatever.

We are entering into an era now in eastern Europe in which a large number of countries are going to be competing. Right now it is being led by the Japanese and the Germans. If we look at what has happened in Thailand, for example, in the last couple of days, there have been articles about this in the paper, but some of us have been watching it for the last several months, if not years. It has also happened in parts of South America.

Our foreign policies generally are to give grants, money, and aid to countries, and then those countries exercise their judgments as to how to spend that money. The Japanese policy is to give grants, aids, concessionary terms, et cetera, expecting that a significant part of those grants, aids, concessionary terms, et cetera will come back to the Japanese in terms of jobs, equipment, technical assistance, advice.

First of all, do you agree with my basic premise that their approach is significantly different than ours? And if you do agree with me, do you believe that we should be altering our approach? In things that you have written—and I am not familiar with all of your writings—I have not seen these questions addressed as directly as I am hoping that you might be able to address them today.

Mr. PRESTOWITZ. Well, it is kind of a mixed bag, Senator. Historically, the Japanese aid has been highly tied to purchases from Japan. In recent years, that has diminished somewhat. And I think really the operative factor in Japan is not so much the legal requirement as it is rather the informal practices. Legally the tying of Japanese aid has been reduced substantially. In practice it still mostly winds up in the hands of Japanese suppliers because, not so much of the law, but because of the relationships that exist between, on the one hand, the government and participating companies, and on the other hand, between Japanese consulting companies and construction and producing companies.

I think the ideal solution would be to greatly expand the role of multilateral organizations. I think we are going to increasingly be wrestling with the question of burden sharing in the next 10 years. And we need to shift a great deal of the burden to Japan and to Europe, and particularly to Japan because Japan has all the money. And the ideal way to do that I think would be to have Japan and others funding multilateral organizations which then provide the aid to recipient countries on an essentially untied basis.

Having said that, you get back to the tactical question, and that is that while what I just suggested might be an ideal solution, before you get there, there is probably a way to go. And my own

feeling is that as long as we are prepared to be the patsy, everybody else will let us be the patsy. And so, we probably have to revise our own practices as a method of getting everyone else to agree to the multilateral approach I mentioned.

The CHAIRMAN. Senator Bryan.

Senator BRYAN. Thank you very much, Mr. Chairman.

In recent weeks, a number of us have been following what appears to be an increased level of activity where the Japanese are seeking to tie into the biomedical research capability of America's major universities. Specifically an article that comes to mind is one that illustrates what they are doing at the University of California at Irvine.

My question to you is should that be something that ought to be of concern to us in light of the fact that we do enjoy, at least in an international perspective, preeminence in many of those fields and with the long-recognized Japanese practice of targeting particular industries, particular technologies? It is also a field in which we invest a good bit of public money in terms of our university system. If it is something we ought to be concerned about—and I must say that personally I have some serious concerns about it—what ought our policy to be? Because the university system is in a sense always looking for money, and somebody comes and says, look, we will fund a major project, a major research center, there is a tendency to say you bet. Come on. We would be delighted to have you.

Mr. PRESTOWITZ. Yes. That is a difficult question, Senator. And sometimes in trying to answer that question, I ask it in the opposite way. I ask myself what would be the reaction in Japan if Monsanto or Pfizer or some American company proposed to put a research center on the University of Tokyo campus, and I have to say that it is kind of hard for me to imagine that happening.

But having said that, it is also the case, as you said, that U.S. universities need money. Particularly we need money to fund the scientific establishment that we have. And our tradition is not the exclusivist tradition of Japan. Our tradition is an open tradition, and I think we ought to support our own tradition.

So, I think the real question is how do we ensure that, in these relationships between foreign companies and investors in U.S. universities, Americans are not disadvantaged and that Americans are not paying disproportionately. And if you look at something like the University of California situation, the point you make is quite right. It is a public university. And so, even while it is the case that a foreign company is providing funds, this company is getting the benefit not only of the funds it is providing, but also of all those public funds that are being provided by American citizens.

If, as a result of that, the foreign company would get exclusive technology—if it would get exclusive licenses that would not be available to Americans—I think that would be disadvantageous to the United States.

So, I think the trick here is to establish conditions of these arrangements stipulating that any technology that derives from these efforts must be available to Americans on a free and open basis. And I would even suggest that we ought to consider requirements that provide for the commercialization of that technology in the United States. In other words, it would be possible, for exam-

ple, to pro forma, make technology available. But if it happens that the technology being made available is in an industry which is dominated by foreign keiretsu, where there is practically no chance of American industry becoming involved, then, in effect, it is not a meaningful offer. So it has to be a meaningful offer.

And a way to do that is to require that the commercialization take place in the U.S. so that the benefit of that technology, the jobs that are open to engineers and scientists and what have you go to Americans rather than to outsiders exclusively. That does not mean that we want to keep it from the outsiders. They are free to transfer the technology, but we want to be sure we get the benefit of that technology in the United States.

Senator BRYAN. Thank you very much, and thank you, Mr. Chairman.

The CHAIRMAN. Thank you very, very much, Mr. Prestowitz. We were committed to Mr. Prestowitz. He had to leave at 10:05. That hour has arrived. Mr. Prestowitz, we will excuse you. It is quite obvious that the Senators did not get a chance to ask their questions, nor did I have a chance to ask all the questions that I had in mind. You have done us a great favor this morning to come early, and we understand your having to leave.

Now, let's hear in full from Mr. Hughes and Mr. Choate, and then we will go and ask questions intermittently of all of them and get a good discussion going. Mr. Hughes.

STATEMENT OF KENT HUGHES, PRESIDENT, COUNCIL ON COMPETITIVENESS

Mr. HUGHES. Thank you, Mr. Chairman. It is a real privilege to be here. I did prepare a longer statement in my attempt to respond to the specific questions in your invitation letter. I would like to submit that for the record.

The CHAIRMAN. The statements of both of you will be included in their entirety, and you can highlight them as you wish.

Mr. HUGHES. Thank you.

I would like to start by returning to this question of the competitiveness challenge. I think it is one of the most difficult that we face because it is so strikingly different from any other challenge we've faced this century. There are no endless soup lines, as there were in the Depression. We are not shocked by the fall of Paris or by an attack at Pearl Harbor. We are not even challenged by something like Sputnik, which shocked our pride and arguably threatened our national security at the same time. Instead, this is a day-by-day challenge that comes at a time when, in many ways, the United States is quite comfortable economically. We are still the largest economy, the richest economy, the most productive economy.

Now, that looks a bit different if you step back from the snapshot of today and make a movie of the last 20 years. When you look at that movie, you see one troubling trend after another—rising fiscal deficits, and rising trade deficits. Japan, German, and others are closing the gap in terms of national income and productivity. In individual industries, in fact, we have already slipped behind.

Although a different type of challenge, I think it is a very serious one. The East Asian countries—Japan and the newly industrialized economies of Korea, Taiwan, Hong Kong, and Singapore—already account for about three-quarters of our trade deficit. In one industry after another—Japan, in particular, has captured large shares of the U.S. domestic market and is prepared to challenge us virtually across the board, in a range of high technology industries. If you look at MITI's own assessment of where Japan is and where Japan has come over just a few years, you find that the Japanese are either ahead or equal to the United States in virtually every technology, and in terms of being poised for the future, they are equal in a few, and better poised, in their own judgment, in most.

Now, that still leaves the United States with considerable strengths. We are the largest economy. We have an enormous, diversified industrial base, ample human resources, a university system that is the envy of the world. We do very well by our best students. In grade school and high school, there is an active effort to search out talent. And unlike the Japanese system, when that talent is identified, we often give it a chance to be independent and creative.

And, I do think there are some hopeful signs. I thought the Trade and Competitiveness Act was an enormous achievement by Congress. It was the first comprehensive response to the competitiveness challenge. President Bush has taken an important step, in my judgment, in establishing national goals for education. These are quantitative goals. Year by year—or every other year—when the international exams are given, we will be able to see how close we are coming to the rest of the world in terms of math and science. We know where we are today, which is generally at the back of the field.

Second, the President has elevated the whole question of competitiveness by appointing Vice President Quayle to chair an inside-the-administration Council on Competitiveness. I have talked to the Vice President's staff and they are taking the challenge seriously. I know they put a lot of effort into the question of product liability. I do not know the details of that debate, but I do think they are asking the right questions about it. Is it a situation that threatens the competitiveness of the United States? It is the kind of question that we are going to have to ask about more and more policies as we go along?

I share Mr. Prestowitz' view in terms of where the current trends might lead if we do not reverse them. As I suggested, Japan, Germany and others are closing the gap in terms of productivity, standards, and technology. If we continue to drift along the current path, we could be in second place by the time we enter the early part of the next century. We have already taken two, I think, dangerous steps almost without thinking about them.

The first is to become so financially dependent on the rest of the world. I remember working on the savings and loan crisis last year. Some proposed putting the full cost of the bail-out on budget, which would have arguably required some shifting in the Gramm-Rudman-Hollings targets. The Treasury did not quarrel with the idea that you might save a little money that way, but expressed a

fear about what the international financial markets would do in response to a shift in the Gramm-Rudman-Hollings targets.

Second, we have again, without paying too much attention to it become quite dependent on foreign components, in particular Japanese electronic components and a whole range of products, including many that are used in the Defense Department.

What can we do about this? Many of the prescriptions are familiar.

We should reduce the deficit. That would help lower the cost of capital and lower interest rates which should in turn, stimulate private investment.

We ought to pay attention to public investments in infrastructure, education, and research and development. I found it encouraging when I was reading through Mr. Darman's recent speech at Harvard that he explicitly endorsed the idea of developing generic technologies. I think that is a step beyond the traditional commitment to doing nothing but basic research.

We have to adopt a global view of competitiveness, and bring it, as a perspective, to bear on a whole range of government policies. It is not just government. Industry needs to do a better job at commercializing research, renew its commitment to the work force, and pay attention to quality all the way through the production process.

As you suggested in your letter, Mr. Chairman, trade policy is very much a part of this picture. One of the things that was stressed in the Trade and Competitiveness Act was a comprehensive focus on exports. I think we need to keep that focus whether it is exchange rates, strengthening the foreign commercial service, or paying more attention to the kinds of things that Senator Kasten raised in terms of funding for the trade and development program, more adequate funding of the Ex-Im Bank, and taking a hard look at whether we ought to tie our foreign assistance, as many of our competitors do.

Let me conclude there, Mr. Chairman. I would be delighted to answer your questions or those of any of your colleagues.

[The statement follows:]

U.S. INDUSTRIAL COMPETITIVENESS
Committee on Commerce, Science, and Transportation
U.S. Senate
Friday, May, 11, 1990

Kent H. Hughes
President
Council on Competitiveness

Chairman Hollings and distinguished members of the Commerce Committee, it is a privilege and a pleasure to testify before you today. I have approached today's assignment with some trepidation. As a former Congressional staffer, I know how tough some of the questions can be.

Council on Competitiveness:

Let me start with a word about the Council on Competitiveness. The Council's roots go back to the President's Commission on Industrial Competitiveness. In addition to representatives of the Administration, the Commission membership was drawn from the leaders of business, labor, and academic institutions. Better known as the Young Commission (after John Young, President and Chief Executive Officer of Hewlett-Packard), the Commission finished its work in 1984 and issued its report in 1985. A number of his peers urged him and several of his colleagues from the PCIC to continue the work of the Commission. In 1986, they established the Council on Competitiveness as a private, non-profit institution with a membership, like the preceding Commission, composed of top CEOs from business, labor, and universities.

The Council conducts a number of activities. We publish a monthly newsletter and a biweekly update on legislative and executive branch policy initiatives. We issue an annual competitiveness assessment of the President's budget and, shortly before the Group of 7 Summit, we will release our annual competitiveness index, measuring America's performance against that of the other major industrial democracies.

Like many think tanks, the Council researches a variety of topics -- competitiveness covers everything from exchange rates to education. We are also a consensus-building organization. A Council report brings with it the recommendations of CEOs from a wide variety of American industries, presidents of several international unions, and university presidents from across the nation.

Council Budget and Trade Assessments:

Mr. Chairman, I have provided for each member of the Committee, our assessments of the budget and of America's international trade position.

America's Competitive Position

1. Mr. Chairman, you asked me to analyze the competitive position of the United States relative to Japan and other industrialized countries in Asia.

Today's Snapshot:

If you took a snapshot today, you would be struck by America's relative strength. If you make a movie of the last twenty years, you would identify one troubling trend after another. The trends, Mr. Chairman, suggest that a snapshot taken at the end of this century or ten years beyond would show quite a different pattern in terms of everything from the domestic standard of living to international leadership.

Let me return to the snapshot. Although growth may vary from one quarter to the next, we are still in the midst of the second longest expansion in the post-World War II era -- the longest in peace time. We still have the world's largest GNP and are, by any measure, the world's most productive economy.

By way of contrast, the Japanese economy is roughly sixty percent the size of ours as measured by recent exchange rates. Japan has had extraordinary growth in productivity, but, as recently as 1987, had an over-all level of productivity only 70 percent of our own (according to BLS data). American universities continue to be the envy of the world -- especially at the graduate level -- and American scientists continue to walk off with the lion's share of Nobel prizes. Similar comparisons with the Newly Industrialized Economies of Asia would show them trailing even further behind.

A Wide-screen Movie of the 1970s and 1980s:

The movie, Mr. Chairman, looks quite different. Let me start with trade.

Trade: We have not had a merchandise trade surplus since the recession year of 1975. During the 1980s, we had an aggregate deficit of about $860 billion. After reaching a record high of $152 billion in 1987, the deficit has declined to last year's $108 billion. The outlook for the future is unclear. Recent dollar appreciation against the

yen and deutschemark will push the economy toward higher deficits. Somewhat slower growth in the United States will pull in the other direction. Most forecasters foresee a slight rise in the deficit over the next two years.

U.S. exports have fared relatively well -- except during the rise in the international value of the dollar from 1980 to its peak in February of 1985. We have recently regained our position as the world's largest exporter from West Germany. But, we are also far and away the world's largest importer.

The deficit is concentrated in certain products and countries. Both are centered in East Asia.

Japan alone accounts for almost half our deficit ($49 billion) and the four Asian NIEs for about 20 percent. In terms of products, the deficit in four categories is particularly striking. Despite a sharp price drop in the mid-1980s, the 1989 deficit in oil trade amounted to $35 billion. In autos and auto parts -- most coming from Japan -- we recorded a deficit of over $56 billion.

The consumer goods deficit came to over $69 billion in 1989. The critical products in this category are consumer electronics (-$12bn), textiles (-$3bn), apparel (-$20.4bn), and footwear (-$7bn) [Commerce Department estimates].

Trade Deficit and External Debt: The long string of trade deficits, Mr. Chairman, has turned us into the world's largest debtor.

In 1980 we had a net investment or external debt position of $141 billion. We were the world's largest creditor as late as 1984. A year and a half later, we became the world's largest debtor. The U.S.'s 1989 external debt came to an estimated $630 billion. A trillion dollar debt is only a few years away.

As foreign claims on our future grow, there may be years in which most or all of our real growth is lost in interest payments to service foreign debt.

In East Asia, the debt situation is quite the reverse. In 1981, Japan had a net external investment position of $11 billion. By the end of 1988, they had become by far the world's largest creditor with a net investment position of $292 billion (or more than twice the American position at its peak).

Productivity: Productivity or output per worker is the best single economic measure of a country's standard of living.

In absolute terms we are still the world's most productive economy. In 1987, German productivity was only 81% of America's, the Japanese just over 70%. But the gap has been closing. In 1972, the U.S. standard of living in absolute terms was 22% higher than the average of the other Summit 7; by 1988 the differential had narrowed to 9.5 percent. From 1972 to 1988, Japan's standard of living grew over twice as fast as that of the U.S. Most of the U.S.'s relative decline in its standard of living occurred in the 1970s, with a rise in the mid-1980s, followed by modest declines since then.

Although U.S. manufacturing productivity outperformed the Summit 7 average between 1982 and 1986 returning to growth rates achieved in the 1960s, the weak performance in the 1970s and a slight decline again since 1987 have contributed to a relative decline in U.S. manufacturing productivity over the long term. Since 1972 Japanese manufacturing productivity has risen by 120%, compared with the roughly 49% increase for the U.S. In other words, in 1972 U.S. productivity was 56% higher than Japanese manufacturing productivity; by 1987 the U.S. advantage was less than 6%.

U.S. industry reacted to the twin pressures of a strong dollar and the 1981-82 recession by streamlining its operations and, in many cases, actually closing facilities. We did not, however, increase gross investment in the 1980s, and net investment in new plant and equipment showed an actual decline. We were cutting a lot of fat, but not adding that much new muscle.

Investment: In broad terms, investment includes public and private expenditures for new factories and machines, infrastructure, research and development, and education.

In terms of overall (gross) investment in everything from new houses to new machines, the 1980s more or less kept pace with our past. Between 1980 and 1987, we put 17.9% of everything we produced (or gross domestic product) into investment.

When investment is adjusted for depreciation, the story is more troubling. Net investment in the 1980s fell to 4.8% of GDP compared with over 6% in the 1950s, 60s, and 70s. Domestic saving fell even further -- to a low of 3.0%. The difference between low investment and even lower saving translates into our large trade and current account deficits in the 1980s.

Nor do foreign comparisons bring any comfort. In terms of gross investment, Japan routinely out-invests the United States by a wide margin with rates that have exceeded 30% of

GDP. Last year, with an economy that is about sixty percent of ours in terms of size, Japan actually invested more dollars than the United States. That puts the latest technology to work in Japan's factories and the best tools in the hands of the Japanese worker.

Saving and investment rates are even higher in some other parts of East Asia. The high rates in Korea and Taiwan are all the more impressive because, unlike Japan, both countries put 6% or more of GDP into military spending.

Infrastructure: U.S. investment in infrastructure has been on the decline. Public works projects such as roads, airports, and harbors make for the efficient transportation of goods and are, therefore, essential to a competitive continental economy. Between 1965 and 1985, total public spending on infrastructure dropped from 3.5% to 2.5% of GNP. Over roughly the same period, Federal spending on infrastructure declined from 10.9% to 4.5% of each nondefense dollar.

Comparable data for our major trading partners is difficult to obtain, but any recent survey of the state of German roads and canals, for example, reveals a highly efficient, well-maintained system of transport.

The Japanese have concentrated much of their industry on the coast, minimizing the inland transportation costs of imported raw materials or exported finished goods. The Koreans and Taiwanese have adopted similar strategies.

R&D: The figures look good for the U.S., if total R&D spending as a percent of GDP is taken as a measure of the U.S.'s commitment to developing new technology. In 1987, for example, the U.S. spent 2.8% of GNP on R&D funding and in absolute terms spent more than Japan, Germany, France, and the UK combined.

However, military/defense technologies have become less and less relevant for commercial application. The trend has in fact reversed, with more civilian technology breakthroughs being transferred to the military than vice versa. U.S. non-defense spending on R&D has remained at about 1.8% over the past 20 years. This is in stark contrast to the upward trend of such major economic players as Germany and Japan, which have increased their rates over the period 1972 to 1987 (from 1.8% to 2.6% and from 1.8% to 2.8%, respectively).

Over half of U.S. government spending on R&D goes to defense-related purposes. Arguably, this may have been necessary in the interest of national security during the Cold War era. It does not, however, change the fact that the growing foreign economic challenge may in part stem from

the steadily expanding civilian R&D focus of our major competitors.

Education: Overall, U.S. levels of spending on education are not the problem. In numerical terms, we are amongst the "high-spenders" on education by any measure: as a percent of GDP or by expenditure per pupil. UNESCO figures show that total spending on K-12 and higher education in 1985 came to 6.7% of GDP. The Germans allocated 4.6% and the Japanese 6.5%. The numbers are notoriously difficult to evaluate, especially on an international comparison basis. Even if they were comparable, the critical question is one of efficient allocation of monies.

Other more quality-oriented measures are more relevant for this exercise. In test scores, U.S. students score consistently below the international average in such subjects as chemistry, biology, physics, geometry, and algebra. A quarter of our students leave school prematurely. Forty percent of the science and engineering graduate students at U.S. universities are foreigners. If such trends continue, we may lack the domestic human capital that is absolutely necessary for a competitive economy.

The real problem seems not to be in higher education, where our university system continues to earn international respect, but in K-12. It is here where the pipeline for America's future economy begins. The lack of a challenging curriculum for the moderately to exceptionally gifted child and the lack of solid vocational training for those who seek it will undermine our economy more certainly than anything else. In any case, the education system must be revised to focus on math and science, on analytical thinking, and a less parochial world view.

Technology/Science: Our technological position can be assessed by a series of measures, e.g., changes in the rate of U.S. patents granted to U.S. inventors; changes in market share of U.S. pioneered goods; international comparative levels of capability in critical new technologies; and a comparative analysis of the R&D process.

- Patents: The share of U.S. patents issued to U.S. inventors has declined since peaking in the early 1970s. Foreign applicants increased their share of U.S. patents from 35% in 1975 to 46.6% in 1987. The Japanese make up the biggest part of this increase (with a doubling of their share).

- Market share: To cite some examples of erosion of market share in U.S. pioneered goods: U.S. companies claimed 90% of market share for phonographs and color TVs in 1970; by 1987 the

figures were 1 and 10%, respectively. In 1970, the U.S. had 99% of the domestic market for telephone sets; in 1985 this figure had dropped to 25%. The domestic share for semiconductors slid from 89% (1970) to 64% (1987) and is still eroding. The U.S. share for Dynamic Random Access Memory Products (DRAMs) has fallen from 95.8% of the world share in 1975 to 17.9% in 1987. FAX machines, VCRs, and even cellular phones are examples of U.S. (or joint U.S.-foreign) inventions picked-up by foreigners, developed abroad, and sold back to the U.S.

In the area of new technologies, the Japanese are the most scrutinized competitors. Indeed, by MITI's own estimates they are on their way to equaling or surpassing U.S. industry's technological capability in such diverse areas as semiconductor memory devices, microprocessors, CAD/CAM, aircraft engines, skyscraper construction, fine ceramics, and advanced composite materials. The technology engine has been running steadily in the Japanese laboratory, further fueled by the income generated by successful sales of the outcome of their work.

The Japanese, however, are not the only nation engaged in a technology build-up. The Europeans are committed to a competitive industry. Most notably the Germans continue to expand their precision industries and like the Japanese, have built much of their surpluses on a thriving automotive export sector. The Asian NIEs have built up a reputation for producing inexpensive, good quality consumer durables - whether this be goods like apparel/footwear/textiles and toys, or more recently, such higher-profile products as automatic data processing (ADP), consumer electronics and even cars.

- R&D Process: The U.S. has a strong research and innovation capability. Foreigners are attracted by the open academic environment, the quality and ability of U.S. industry R&D teams, as well as the interaction between these two groups. What America is not particularly skilled at doing is developing products for commercial application in a timely fashion.

  Others, namely the Japanese and increasingly other Asian economies, have proven to be most adept at taking basic U.S. ideas and prototypes and developing a practical, high quality, and reasonably priced product. Rather than focusing on generic capabilities, they take a particular product and design it to meet consumer needs. This aspect of

development also means maintaining great flexibility at the production level. Foreign competitors have been most willing to incorporate high tech even to such traditionally low-tech sectors as textiles. This pragmatic approach has until recently been neglected in U.S. industry.

Evaluation of the Challenge/Response

2. In addition to assessing our current competitive position, Mr. Chairman, you asked us to evaluate the seriousness of the challenge from East Asia and how well we have responded so far.

In my view, the challenge is very serious. We have already lost a significant portion of world and domestic markets to import competition from Japan and elsewhere in East Asia. In particular, Japan is challenging the United States for preeminence in a number of high technology areas that are important for future growth and national security. They are poised to do more. For instance, in the area of X-ray lithography -- widely expected to be a critical element in the future production of semi-conductors -- only one U.S. firm has a project under way. Several Japanese firms are pursuing that technology.

So far, the U.S. response has been mixed. There are positive steps. The Trade and Competitiveness Act of 1988 made changes in everything from trade policy to teaching. It was the first truly comprehensive response to the competitive challenge coming from East Asia and Europe. President Bush has taken some additional steps. For the first time, we have explicit national education goals.

The President has also put the Vice President in charge of a new Council on Competitiveness in the Executive Branch. I have talked to the Vice President's staff, and I know they have been very active on the product liability question. I am not familiar with the intricacies of the product liability debate, but they have quite explicitly addressed the issue in the context of competitiveness by comparing the Japanese and European approach with our own.

Strengths and Weaknesses: Despite a decade of mixed economic news, the United States retains enormous strengths. We are still the largest and the richest of the industrial democracies. We have a university system that remains the envy of the world.

The best of basic science and a large number of inventions continue to flow from American laboratories.

The top American students are given a solid education and an opportunity to pursue independent creativity at an early age.

We are pioneers and pragmatists -- a good combination in a world where we will need to be both innovators and imitators, as we lead in some fields and catch up in others.

We are still the only superpower that has the resources to operate successfully and concurrently in the military, economic, and political spheres.

There are weaknesses as well, many that are matched by Japanese strengths.

- Saving and Investment: By world standards, we save and invest at a relatively low rate. Since the end of World War II, Japan has set the standard for saving and investment among industrial democracies.

- Education: Japan does a superb job of preparing the average student for working and adult life. Most graduate from high school into a society where illiteracy is unknown. According to many reports, the average student leaves school with a body of knowledge similar to that of an American college graduate.

- Global Economic View: Japan has kept its eye on global markets, adopted foreign technologies, and scoured the world for opportunities. America's international priorities have been political and military.

- National Priorities: In addition to national security and containment of the Soviet Union, America has made post-war priorities of health and housing, agriculture and space. In Japan, institutions have been geared to build an ever more sophisticated industrial base.

The Mix of Different Systems: The Japanese economic system works quite differently from our own. They appear to violate most of our modern rules of thumb. Government often works closely with industry in developing new technologies, stimulating new industries, and managing decline. In place of free trade, Japan coddles infant industries and has a distinct penchant for building and buying at home. Antitrust laws are only occasionally enforced. Instead, extensive cross ownership, tied sales, and bank participation in the Japanese conglomerate (or Kei-retsu) have allowed large organizations to compete intensively and

still take the long view in terms of investment, research, and market development.

The Japanese model has proved very effective at concentrating resources, asking the most of existing technology, and penetrating a largely open American market.

The Japanese approach has often short-circuited an American economy geared to innovation, mobility, and geopolitics.

There are two open questions about the Japanese system. Will it prove as effective in developing new technology or basic science as it has been in making the most of existing world opportunities? Second, will the Japanese systems work as well when others adopt a similar approach? Korea has self-consciously imitated the Japanese model and Europeans appear interested in trying their own version of it in the high technology area.

Implications for U.S. Standard of Living/World Position

3. If trends do not change, what are the implications for America's standard of living, commercial position and national security?

America has enormous strengths. There are some signs that we are already beginning to respond to the competitive challenge. Our fate is still very much in our own hands.

The current trends, however, are troubling and, over time, they could endanger our national security, weaken our commercial position and lower our relative or, perhaps, even our absolute standard of living.

National Security: It is hard to think of a loss of national security when Central Europe is moving toward free markets and democracy and the Soviet threat has receded.

But while we pursued containment to a successful conclusion, we have quietly, almost unconsciously, taken two risky economic steps. First, we now routinely look to foreign capital to fund a significant portion of our national debt and our private investment. Second, we have become noticeably dependent on foreign components and technology, particularly in the critical field of electronics.

Commercial position: We have already lost some industries and large portions of others. Some analysts see the Japanese poised to move beyond semiconductor equipment, supplies, and memory chips to compete across the board, from supercomputers to software.

At present, the U.S. continues to dominate the world market share in commercial aircraft. So far, Japan has not posed a challenge to the U.S. aerospace industry, but market observers are aware of Japan's long-run commitment to compete successfully in this sector, as well.

Standard of Living: Average real wages have stagnated in the U.S. for most of two decades. Family income and per capita income have risen largely because both spouses work and family size has shrunk.

We face a potentially difficult future. Trade and current account deficits will add to our external debt, increase the foreign claim to American growth, and add potential strains to our financial system. If productivity stagnates, the growing foreign claims will be applied to less and less growth and to an economy forced to adjust to more effective competitors.

Federal Government and American Institution Roles

4. What can and should the Federal government and other American institutions do to help reverse the relative decline of the U.S. industrial base?

Federal Government: Every national government helps set the stage for growth and a competitive nation. For instance, deficit reduction will help lower the cost of capital and should stimulate added private investment. Public investments in infrastructure will lower private costs and make industry more competitive. An educated work force lets industry make the most of new technology and the latest equipment. Government funding for basic research and the development of generic technologies contributes to more rapid productivity growth, more competitive industries, and a rising standard of living.

Private Industry: Business leaders have been working on several steps to help make their firms and hence the country more competitive. Worker involvement and education, just-in-time (JIT) inventory systems, and more rapid commercialization of new technologies have all played a role. Perhaps the most important change is a three fold shift in business thinking:

- Taking a global view of competition and opportunities -- whether for new markets or new technologies.

- Adopting pragmatic partnerships with other institutions. The new partnerships can range from business consortia that share the risks of research

to working with a local school system to help develop future employees.

- A renewed commitment to total quality management (TQM) - from the factory floor to the corporate headquarters.

The Schools: Germany and Japan are not rich in natural resources. Their agriculture is not, for the most part, internationally competitive. Although Germany has accepted some guest workers in the past, both countries rely on their native populations rather than looking to immigrants for talent and skills. They have built their industrial success on superb elementary and secondary schools. We need to look at the strengths of their systems and build better schools based on our own traditions.

Finally, there is the rest of us: We need to make many of the same adjustments in our personal thinking that are being made by other American institutions. Today's children will face global opportunities and global competition. Whether it is setting standards at home or helping with the schools, parents and every citizen will carry an extra burden of responsibility. In other words, a thousand points of light will not be nearly enough.

U.S. Trade Policy

5. What direction should U.S. trade policy take to foster the competitiveness of U.S. businesses?

Mr. Chairman, the Trade and Competitiveness Act of 1988 put much of its focus on exports and export policy. We need to put that philosophy to work. I would suggest several steps:

- Exchange Rates: Short term international competitiveness is heavily influenced by exchange rates. When writing budgets or supporting a monetary policy, exchange rates are one of the factors we need to keep in mind.

- Export Controls: As part of our policy of containing the Soviet bloc, we have had a strong policy of restricting exports of goods and technologies that could strengthen the Soviet military. In practice, our controls have been stricter than those of our allies. These have, by most estimates, cost the country billions of dollars in high technology exports every year. With the changes in Central Europe and the Soviet Union we have an opportunity to fundamentally rework that

policy with movement toward an essentially license free export zone for the industrial West.

- Export Policy: Compared with other countries, we do relatively little in terms of export financing, funding of feasibility studies, or of supporting a foreign commercial service. We need to do more on all three fronts.

- Market Access: America continues to have considerable strength in agriculture, heavy equipment, and high technology. These are all areas were market access has been restricted abroad.

Part of Japan's success in moving from traditional to high technology industries has been the combination of an emphasis on international competitiveness coupled with a protected domestic market. That has put American competitors at a double disadvantage. First, they are denied the added sales that would come from equal access to the world's second largest national market. Second, the Japanese firm can build its international position on a protected domestic base -- a luxury denied to most American firms.

We need to continue to pursue market access and American economic interests through the use of Section 301, Super 301, and Special 301 as well as through multilateral negotiations.

- The Uruguay Round: The current round of trade negotiations has also been, in part, about barriers and subsidies that limit U.S. exports. A successful conclusion of the negotiations could increase opportunities for agricultural, service industry, and high technology exports.

There are two other broad steps that are important for future U.S. trade policy.

- First, we need to institutionalize the growing importance of trade policy to our national security and our economic future. There have been a variety of proposals to help make that happen. Some have proposed creating a trade Council that would parallel the workings of the National Security Council. Still others have suggested adding the trade agencies to the National Security Council and defense agencies to the economic councils. And still others advocate a Department of Trade. Whatever particular steps are taken, the direction is clear.

- Second, we need to administer and adapt our trade laws with global competition in mind. For instance, when we provide temporary import protection, the focus should be on helping the workers or the firm compete.

Mr. Chairman, that concludes my testimony. I will do my best to answer any question you or your colleagues might have.

The CHAIRMAN. Very good.
Mr. Choate.

STATEMENT OF PAT CHOATE, VICE PRESIDENT, OFFICE OF POLICY ANALYSIS, TRW, INC., ARLINGTON, VA

Mr. CHOATE. Thank you very much, Mr. Chairman.

I think a useful point in opening my statement is to express a small degree of cautious optimism, and the optimism is based around two things.

One, we are a $5 trillion economy, and the truth of the matter is we did not build a $5 trillion economy because we are incompetent or because we are dunderheads. We really have many industries that are the very best in the world, and we have millions of workers that are hardworking. That provides a solid base to deal with the rest of the world.

And the second basis for my optimism is that I think that the United States now finds itself in a time when there is a growing recognition that our present policies are simply unsustainable, the changes are required. And it is my observation, at least in taking a look at the American policy process, that policy shifts come almost as a seismic movement. Pressures build, understanding develops, changes occur very quickly. It happened in 1913 with the New Freedom with Woodrow Wilson, in 1933 with the New Deal with President Roosevelt, in 1981 with the Reagan Revolution. It is my view that we are at a point for another major policy shift for two basic reasons.

The first is that our present policies are simply unsustainable. And the second is that we have essentially fulfilled the big idea that has dominated our international policy for the past 40 years, and that is the containment of the Soviet Union. In truth, for 40 years, we have been guided by two big ideas: contain the Soviets, and achieve prosperity in Europe and Asia. We have achieved that.

Now, in the process of doing that, what is increasingly becoming obvious is that national influence in the 1990s in the 21st century is going to be less through the tools of war and more through economics and technology and science. And what that really requires in this new theory, this new paradigm, is that we rethink our fundamental policies.

When one takes a look at trade policy, I think that what is becoming increasingly obvious not only to public policymakers, but to academics is that there are essentially four different economic models at work now in the world. One is the Marxist model, which is clearly collapsing. Another is the mixed economic model that we see in Europe where you will have some private ownership, some public ownership, some joint activity. We find the Anglo-American model, the free trade model, and then we see the Japanese form of capitalism. And it is equally obvious that a free trade regime, a GATT-based regime, is unable to bridge the differences between those systems.

And so, we are at a point where what we really require is a refocusing of our trade policy to that of expanding trade rather than that of getting others to adopt the Anglo-American free trade

model. And it is also to say that there are more ways to expand trade other than simply a free trade model.

Now, in dealing with that, I think it also important for us to recognize that global commerce in the 1990s is more than imports and exports today. It is also a question of investment. And so, the question really becomes one of having commercial policies that deal with commerce in its totality, imports, exports, investment here and there, and how we compete in third markets. I will give you an example.

We find, for example, with the Europeans that we have had difficulties with them that those difficulties by and large are minor because what we find is the Europeans will take our goods and our exports and the Europeans will take American investment. When one takes a look at Germany, what one finds is that roughly 12 percent of the manufacturing employment in Germany is foreign owned. In the U.S., it is 9 percent. But what we also find, in Japan it is less than 1 percent owned. And so, here is a major means of market penetration, at least to the Japanese market, that is denied foreign investors.

The second thing we see is that the Europeans will take actually a higher proportion of foreign manufactured goods than does the United States and certainly at a much higher percentage than does the Japanese economy.

So, in a real sense what we require is a trade policy that will take and deal with essentially free trade economies, such as Canada, with free trade arrangements, as we have done, that will deal with the Europeans that are going into a mixed economy with some form of a quasi-free trade arrangement, and then with the Japanese is to deal with a very different sort of an arrangement, one that is much more results oriented, which is in effect, the way that economy operates.

I was in Japan three weeks ago for the U.S. Information Service doing a series of debates, and it was very interesting because I was making the argument that all western-trained economists, myself included, really prefer free trade. We think it is best. It is superior. It works. It takes care of the consumers. It is the most efficient use of resources. But on the other hand, at least as I took a look at the Japanese economy, the only way that a free trade arrangement could occur is if the Japanese would first break up their keiretsu. That arrangement of a Japanese style conglomerate is simply illegal in the United States and many other western economies and it gives in effect, through the internal relationships, an advantage to those companies, and it denies the advantages that an American company might bring to the market.

The second point that I made to them is the Japanese would have to break up their distribution system. And there we find a circumstance where costs are 30 or 40 percent higher. There are very real restrictions upon foreign firms being able to penetrate that distribution system, and that too is in itself a fundamental obstacle to free trade.

And third point that I made to them is that it would be necessary for the Japanese to break up their extensive reliance upon cartels. The OECD has identified 93 government sanctioned cartels that operate in Japan. And again, per se, those cartels would be a

violation here in the United States because they give the participants the obvious advantages that a cartel brings.

And so, the question that I put to the Japanese: if you want free trade, you must do these things. And if it is impossible for you to do these things—and I think it is, to be quite honest about it—then what we require is an arrangement that recognizes those institutional differences. I personally do not believe it is possible, through the structural impediments initiatives, for the United States to persuade Japan to make those breakups, and I think politically it is an intrusion in Japan's domestic affairs. We should simply deal with the Japanese as they are.

Domestically there are some obvious things I think that are required, and I am again cautiously optimistic that there is an understanding that it needs to be done evidenced in one measure by these hearings.

First and obviously, we require microeconomic balance because, as I point out in my testimony, one of the real problems that we have is a greater cost of capital, and one of the fastest ways to deal with that is to bring down the budget deficit which will necessarily increase our savings, which we all know.

And as Mr. Hughes and Mr. Prestowitz have discussed, we need an investment strategy for the 1990s on our infrastructure, our scientific establishment, our education system. That has been I think fairly well documented.

There is something else that is less documented that has been the subject of little discussion, but I think that is quite important, and that is the question of recognition, that our competitors in Asia and our competitors in Europe are making a massive social effort to develop the industrial technologies that will shape work and life in the 21st century. We find in Europe massive amounts of monies being put behind these high resolution systems, behind the semiconductors, behind advanced materials, and dozens of other generic technologies that are just at the point of being integrated into industrial production.

Now, our firms, as good and as competent as they are, cannot compete against firms that are receiving billions of dollars of subsidies to assist them to get into the marketplace. It just cannot happen. There is a question, therefore, of how will the United States deal with this. Now, to the present what is happening is our firms in the United States, to not be left out, are increasingly finding themselves moving into joint ventures and as a condition of participation in those consortiums are moving their operations to Europe and to Japan. That is not good in the long term for the United States. It seems, as a basic test, at least on certain generic technologies, that the United States must stand forth and say that we are simply going to meet that competition.

A second thing that I think is absolutely essentially is we need to take a look at our rulings here in the United States and see which of these impede the natural competitiveness of our best industries. One of those, which this committee has addressed, is the question of how do you take the telecommunications industry and enable them to be fully competitive. There is the question of how do we deal with this issue of product liability. There is a whole series of

these questions of how do we in effect remove our own self-imposed obstacles to competitiveness.

And then finally, there is the question I think with the growing investment of foreign firms within the United States, and that is how do we bring true national treatment to those firms. One of the things that has intrigued me, for example, is the work that is now under way in the House Ways and Means Committee on the oversight committee which seems to indicate that many foreign firms are vastly underpaying their taxes in the United States, 12, 16 plus billions of dollars. I think that a central element before American taxpayers and American companies are asked to sacrifice more is the absolute assurance that foreign firms are paying their full share.

Second, and I think more importantly for the long term, it is appropriate I think for the United States to take a look at how our antitrust policies are applied to foreign firms operating within the United States. We have a radically different circumstance today than what we had five years ago due to the large amount of foreign investment. What we find is that American policy has been that a foreign cartel operating in the United States was given an exemption from American antitrust laws if the foreign government would assert that they forced their firms to engage in the cartel, a concept of sovereign compulsion. Naturally the firms say that their government made them do it. Naturally their government says that they made them do it.

So, suddenly we have a circumstance here in which we are operating with two sets of rules. One set of rules is many of the foreign firms, as they operate their facilities inside the United States, have all of the advantages of a cartel. They have all the advantages that come from being able to work together and undertake certain activities. At the same time, we find that the American companies find themselves in a position in which they do not have those advantages. We really need one set of rules and very aggressive antitrust enforcement and one set of standards for all.

So, in summation, I am very confident that the American industry can more than meet this competitive challenge, but I think that what we really do require is some new thinking and some big new policy shifts here in the United States. And I think in this interim period, as we prepare for such a shift—and it will come inevitably simply because the forces of circumstances will demand it—I think it is very important to think what the agenda should be on that.

So, I would be pleased to answer any questions.

[The statement follows:]

STATEMENT OF PAT CHOATE, VICE PRESIDENT, POLICY ANALYSIS, TRW INC.

Mr Chairman and Members of the Committee:

I am pleased to have the opportunity to share with you some thoughts on American productivity and competitiveness. In fairness to you and my employer -- TRW Inc. -- I also want to point out that the views that I offer are my own and are not necessarily representative of the position of TRW or any other organization.

While the United States is no longer the world's dominant economic power, neither yet is Europe or Japan. Regardless of whether the current situation is an interregnum or a permanent state, America has an urgent need to address several fundamental structural problems. I will address three of these -- the high cost of capital, the pressures on companies to sacrifice the future for the present, and an antiquated national trade and investment policy.

Capital

Of all political and economic factors, the high cost of capital is probably the most formidable obstacle to strengthening America's competitive edge. George Hatsopoulos, chairman of Thermo Electron, and Stephen H. Brooks, an economist, have calculated that the cost of capital is almost three times higher in the United States than in Japan.

In the past, when U.S. superiority in productivity and world markets was unchallenged, such a wide difference in capital costs was relatively unimportant. This disparity is now pivotal.

For purposes of illustration, assume that the cost of capital in the United States is 9 percent and in Japan 3 percent. For every $1 billion of capital deployed to produce goods and services, therefore, Japanese firms would pay $30 million annually while American companies would pay $90 -- a difference of $60 million.

All other things being equal, American companies start-off having to be six percent more productive than their Japanese competitors just to offset the higher cost of capital in the United States. In business, that is an enormous burden. The substantial carrying-cost advantage enjoyed by foreign companies enables them to offer their goods and services at lower prices than competing American firms.

Conversely, the higher capital costs in America increases the risks for U.S. companies and decreases their capacity to invest in automation, research, innovation, worker training, marketing and other activities that can further strengthen their productivity and competitiveness.

Many factors contribute to the higher cost of capital in the United States. Hatsopoulos attributes much of the differential to the practice in other nations of using higher debt-to-equity ratios. Martin Feldstein, former chairman of the Council of Economic Advisors, traces this higher cost to the large volume of federal borrowing needed to finance the national government's budget deficits. Others attribute it to taxation of interest income on savings, capital gains and dividend income.

Regardless of how these factors are weighted, one thing is clear a lower cost of capital -- and the a lower federal budget deficit and more national savings required to achieve it -- are absolutely essential if America is to have the productivity and competitiveness that it requires in the 1990s.

The Short View – Sacrificing Tomorrow for Today

The capital issue transcends cost. There is also the question of how available capital is used. Over the past decade and a half, it has increasingly been used for speculative rather than productive purposes.

If business is to take a longer-term focus, it requires an economic environment that permits and encourages long-term action. The creation of such an environment hinges on a reduction in the demands of investors for immediate returns, regardless of longer-term consequences.

In turn, this requires a recognition that control of America's major corporations has steadily shifted from individual investors to financial institutions -- pension funds, insurance companies, foundations, investment companies, educational endowments, trust funds, and banks. This shift has far-reaching consequences, because individuals and institutions invest in the stock market for sharply different reasons; individuals are primarily investors looking for long-term performance; institutions are pursuing short-term profits. Thus, just when U.S. business needs to be

making long-term investments to meet global competition, the new owners -- the institutions -- are pressing for quick results.

Institutions now hold so much equity and are such a powerful presence in stock markets that most corporations are at the mercy of their demands. The raw economic power of institutional investors can be measured in two ways; their stock holdings and their willingness to get rid of stocks that fail to produce quick earnings.

Institutional stock holdings have risen rapidly over the past three decades. By the mid-1980s, institutions held more than 35 percent of all equities listed on the New York Stock Exchange (NYSE), double their share in 1960. By 1990 they are expected to own half. Already, institutions have half to two-thirds of the stock of the nation's 200 largest corporations.

Yet their biggest impact comes not through mere ownership but through the growing pace of their transactions. In 1953, when institutions controlled about 15 percent of the equities listed on the NYSE, their trades constituted a quarter of stock market transactions. Today, institutional trades constitute almost 90 percent of transactions.

As a result of such hyperactive trading, the fundamental focus of the stock market has been transformed from long-term investing to short-term speculation. This shift can be gauged by both the rising volume of large-block stock transactions (10,000 shares or more) by institutions, and the quickening pace at which the entire value of stocks listed on the NYSE is traded.

The exchange reports a two decade trend of steady increases of large-block transactions, and they are overwhelmingly by institutions. In 1965 there were, on average, only nine large-block transactions a day, constituting 3 percent of the daily volume of the market. By 1980 the average number had risen to 528 per day. Over the past eight years, the number of large block trades increased by 600 percent, soaring to an average of 3,639 per day in 1987, half of the total volume on the NYSE.

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Because institutions own such a large share of all stock, and trade that stock so zealously, there has been a sharp increase in the turnover rate of the entire NYSE (the pace at which the total value of stocks listed on the exchange is traded). Until a decade ago, the turnover rate was less than 20 percent a year. By 1987, it was up to 73 percent (chart 3). At the 1970s pace, it took 5 years for the entire value of the stock market to turn over, but today it takes only 15 months. This is speculation, not investing.

In the speculative, short-term-oriented equity markets that now exist, only a few American firms, such as General Electric, IBM, General Motors, and Exxon have sufficient profits and assets to make the commitments that long-term global competitiveness requires without sacrificing shorter-term earnings. Most companies are obliged to focus their efforts and resources on results that can bolster the price of their stock.

Fast results and short-term earnings have become the obsessive goal of too many American companies. The pursuit of these objectives diverts resources from investment in modern plant and equipment, research, technology and training to clever financial manipulations. It sacrifices market share to high quarterly earnings. And it discourages workers from making long-term commitments to companies.

By ceding the future to the present, American firms have greatly reduced their capability to cope with foreign competitors whose actions are shaped by long-term perspectives. And what's worse, they are being forced into this posture by unproductive speculative pressures created outside the corporation. As a consequence, America is making poor use of its limited capital.

Pragmatic Trade Policies

Despite America's spirited advocacy of a global free trade regime, it has little appeal to many other nations. We are at a turning point. Either we must find someway to convince other nations to adopt

the industrial structure and free trade philosophy that has served us so well or find a way to work with others as they are.

If we are to convince others to be like us, then we must somehow convince them to abandon practices that have served their interests well and adopt those that will serve ours. I doubt that we are that persuasive. Realistically, it is we who must adapt.

What America requires is an approach to trade that can meet the following standards:

- **Deal with both trade and investment flows**

  Increasingly companies extend their economic presence in global markets both through exports and investment. U.S. trade policy has concentrated almost exclusively on imports and exports. By ignoring investment, we are losing exciting opportunities to open markets for American producers.

- **Make expanded trade the goal of negotiations**

  Too often the basic goal of prior trade negotiations has been to persuade others to adopt a free trade approach. Equally often, this would require impossible domestic political changes in other countries. What do we really want. I suggest that it is expanded trade. This may be different than free trade. If this is correct, we should be clear about our objective in trade negotiations: that is, expand trade rather than doing missionary work on behalf of our free trade ideology.

- **Accommodate differences in economic systems**

  Other countries compete in the world marketplace using vastly different assumptions, serving vastly different ends that America's. Economic systems differ in ways both manifest and subtle, reflecting basic differences in history, culture, national aspirations and politics. In short, America should establish free trade relations with

those societies, such as Canada, that practice free trade; managed trade with managed trade economies; and something in between for all others.

- **Adapt the negotiating tactics to the circumstances**

  In the past, the United States has put most of its eggs in a multilateral negotiating basket. Yet, many of our most pressing economic challenges are of a bilateral nature. Equally important, a number of trade issues are of a plurilateral nature, such as protection of intellectual property rights of the industrial nations. Finally other issues involve most nations and thus are most appropriately deal with through GATT. In sum, we require the flexibility, and the negotiating resources, to pursue dual negotiating tracks.

Conclusion

If America is to have the productivity growth and competitiveness that it requires, a number of steps are required -- redress the imbalance in our macroeconomic policies, make substantial new investments in infrastructure, education and science, and improve the operations of our government, among many others.

As we take these steps, we should proceed with the recognition that Americans are a productive and competitive people. Slackards do not build a $5 trillion economy. But we can do better. The process of doing better, moreover, offers this generation and the next exciting opportunities. The most important challenge we face is recognizing and seizing them.

Thank you.

The CHAIRMAN. Well, you both have given us a lot of food for thought.

Mr. Choate, I like that positive side. I had to go through a three year trip around these United States in a campaign, and I learned one thing when I was in Lincoln, Nebraska, out in Wisconsin, or wherever, that the American people out there are very, very productive, very competitive, very ingenious and dedicated—they are not the lethargic stoops that the Washington politicians describe as having to get off the golf course. Every time you get a trade issue, you go down on the floor of the Senate and some silly Senator runs along and says we have to get them off the golf course. Well, it is sheer nonsense. What we have to do is get the politicians out on the golf course and out of this place and get a new group and start thinking.

Now, right to the point, how do we do it?

Senator Rockefeller has asked a question of Mr. Prestowitz as to listing of industries.

Twenty-nine years ago, we had a little textile problem, and Candidate Kennedy was committed to solving it. And following through in the early part of his administration, we formed a committee to conduct a hearing to determine whether or not textiles were important to our national security because the law said you had to make a presidential finding to authorize the President to enunciate his seven point program. And we had the Secretary of State, Dean Rusk; and the Secretary of Defense, McNamara; the Secretary of the Treasury, Dillon; the Secretary of Commerce, Luther Hodges; and the Secretary of Labor, Arthur Goldberg. Mr. Hickman Price came, and he and I worked and got the witnesses. We had the hearing, and then we promulgated the policy on May 4. We found that next to steel, textiles was the second most important to our national security because we did not want to send them off to war in a Japanese uniform. That literally was the finding.

Now, are we going to use that procedure, or are we going to determine this on an ad hoc basis? Some of us want it for semiconductors, some for high definition television. And then the electronics industry comes up with something else. And we are just running around pillars to posts trying to find symbols to show my erudition that I know something about competitiveness.

How do you get this? Do you go through a series of findings?

Do you orchestrate, as I indicate, with a national trade council to correlate all these 28 departments and entities into trade and economic security because we have moved from the cold war to the trade war?

And how do we compete in that trade war and not just look for uniforms in time of war, but clothing itself, and not just consumerism, but holding on to our fundamental industry, steel, aluminum, rolling stock? You cannot deliver your wheat on an optic fiber, and they are always talking about a service economy. We do not have any American automobiles. I mean, they are foreign parts assembled here. We have adulterated the foreign trade zones program. Those are other problems.

How would you do this if I called you in and said, all right, now let's do it? We are not just going take semiconductors or whatever.

We want a correlated kind of policy to determine what is necessary to our economic security.

Mr. CHOATE. The first basic premise I would start off with—and I say this having worked for a period of time in OMB. I would not start off with talking about reorganizing the Federal Government. All of the authorities essentially can be found to do what needs to be done. I would begin by, in effect, saying that either I would create an economic competitiveness advisor with appropriate responsibilities, much as was done with the National Security Act in the 1940s, or I would expand the concept of national security with a national security advisor to talk about economic security. That would be first. And their responsibility would be to coordinate the 28 agencies outside the executive office of the President and to come forth with a vision.

The second thing that I think becomes important is it is necessary now to elevate the trade function in our thinking and in the professionalization to the same standards that we now have with defense and foreign policy. For example, our trade policies today are guided by the United States Trade Representative, and that office has less than 150 people. By contrast, we wind up today with 1,058 admirals and generals on active duty. Now, the truth of the matter is we only have two people in the USTR full-time that are dealing with Japan. And here we are running close to a $50 billion trade issue. We are not putting the resources to it.

Then as to the question of special emphasis, I think we should begin by saying right off the bat that we are going to take a look at all of those industries and technologies that the Europeans and the Japanese have targeted because we know by that targeting that our companies that are in those particular industries are going to be challenged, and they are going to have the background and the support of their companies. And that is an easy task.

I would then go to the second level, bring in the Defense Science Board and bring in the President's science adviser and bring in some of the leading business people such as are represented on Mr. Hughes' organization, and begin by identifying what we think are 20 or 30 of the generic technologies that are going to underpin most industries in the 1990s and the 21st century. We could see, for example, if we were sitting here a century ago, that steel was going to underpin virtually all industries. The same is true as we move into the 1990s and the 21st century. We can see that electronics, semiconductors, we can see on biotech, we can see on telecommunications, we can see the same on a whole series of advanced materials. We can see the same thing on the video, the high resolution systems. So, it is not an onerous task to do that.

And then I think that our national goal should be to say, at least on those targeted industries that others have said are important to the future, and upon those generic technologies, is to simply say that the United States will not conceded those industries. We will not permit cartels and government actions to work together to, in effect, push us out of those particular industries. If we permit that to happen, we in effect are going to sacrifice a great deal of our economic and political future and a great deal of our standard of living.

So, this is really not an onerous task to begin this process.

The CHAIRMAN. Let me yield. I appreciate this attendance.

Senator Rockefeller.

Senator ROCKEFELLER. Pat, it is not onerous a possibility you say.

Mr. CHOATE. A task.

Senator ROCKEFELLER. A task. And you express optimism, but you express less optimism in your testimony. And I just want to get you from the I'm an optimist to sort of clearly taking us through this process.

One of the things you point out is the so-called short view, and you talk about how when individual investors go into the market, they are more interested in a stable, long-term return, a good solid stock, but then you describe how institutional investors have really taken over and they dominate, and they are interested in a much shorter return. That is not easily turned around.

And I would start with the question, not to have you answer it this second, but how do you turn that around? I would suggest that is not very easily done.

Secondly, you say, well, we'll just get people to understand that these are generic industries that we have to have in our country's future. They have to underpin anything called economic success, and I would totally agree with you. And yet, the history of corporate America and the history of government America, not trusted by either corporate America or by the types of people who come into government America who come from, let's say, the Universities of Chicago or I would refer to it as the Beryl Sprinkles of this world who have absolutely no idea what is going on, but they nevertheless are in positions of power. They come in for four years. They are not government people. They are private sector people. And so, it is not government that is doing this. It is sort of the four-year term, the eight-year term syndrome.

There is an institutional investor and there is the generic industry problem. Now, you said I am optimistic. Just sort of suggest to me a scenario how these things come.

Mr. CHOATE. I would say first of all among the business community there has been an absolute sea change in attitudes over the past five years. If I were categorizing the phases that American business goes through, it would begin with arrogance. Then it moves to concern, and then it moves to panic. And I think that a large number of American businesses move from arrogance to concern and some enter into the panic stage. And so, quite literally, you are seeing many businesses now support things that would not be supported even five years ago in joint work, in supporting of generic technologies, et cetera.

As to the question of the institution——

Senator ROCKEFELLER. I am not going to let you get away with that.

Mr. CHOATE. Sure.

Senator ROCKEFELLER. You say that they are getting panicked. Well, they are getting panicked probably because many of them are getting taken over. They are eating each other up. And that is a source of panic. But that does not mean there is a philosophical change that we have to sustain ourselves on a competitive basis for something called America's economic future.

Mr. CHOATE. I happen to respectfully disagree with you. You are seeing, for example, companies such as IBM that have aggressively stood behind operations such as semi-tech. You see organizations such as the American Electronics Association and all of these companies in Silicon Valley, which as recently as five years ago, would have never supported a national effort in something such as high resolution systems, that are solidly behind it. This is not to say that all are there, but I am saying that there is a wide array of American companies that are now——

Senator ROCKEFELLER. Tell me more then because you have given me one of the most progressive companies in the entire world, IBM, and Silicon Valley, which is the paradise for the future or was. Now extend that to somewhere where I can be convinced that this is more of mainline American thinking.

Mr. CHOATE. Well, I think that what is important is these are the cutting edge companies. These are the companies that really will play a major part in our future. And they are now saying that it is not going to be possible for America to make it in using the standard paradigm, the standard, classic market approach. They are saying that it is going to be necessary for them to be able to work together. They are saying it is going to be necessary for the government to join with them in support. That is a very encouraging sign.

Let me go to the question of institutional investors. I think that the whole issue that is now open, as to deal with the budget deficit, presents a terrific opportunity to deal with the short-term focus. As I indicate in my testimony, one of the driving forces on this short-term focus are the institutional investors who are engaged in hyperspeculation. They are quite literally turning over these funds in these kinds of quick transactions at a rate. That, in effect, means that the entire New York Stock Exchange is turning over at the rate of roughly once ever 16 or 17 months, where it was turning over once roughly every four or five years 15 or 20 years ago. And this happens though these institutions only own 35 percent of the stock held open on the New York Stock Exchange. That is the driving force, these temporary owners.

The way it seems to me to deal with that directly is to remove the tax exemption from many of the pension funds and other institutional trades and do it in a very productive way where you just simply say that if you engage in short-term trading, you're going to pay a tax on that, 50-60 percent or 38 percent or 33 percent, some amount, and that that tax will slide back to zero over three or four years.

Now, the Congress in 1921 gave the institutions, pension funds in particular, an exemption from taxes for the very simple reason that it was assumed that they would be patient capital and help people prepare for their retirement. That trust has been violated. What I am suggesting is here a way to not only raise money through a speculator's tax, but it would in effect slow this massive pressure for quick results. And I would argue it would do something else. It would also improve the returns on the institutions themselves.

As I read the newspaper in West Virginia, what was it? The teachers' fund actually turned over their fund something—what

was it—80 times in 1987 and lost 10 percent of the capital. That is not a unique experience across America.

So, here is a real opportunity to move in and not only preserve people's pensions, but also to get a different corporate behavior because that is what is driving this short-term focus.

Senator ROCKEFELLER. Mr. Chairman, I am sorry to overextend my welcome here.

Pat, I like the words. I just am not following it as I understand the instinct. I would suggest to you that there is a body of thinking out there which says that we have to take a longer view, that we have to do these things that you are suggesting. But as the American economy gets overloaded with debt, there is this sense of impending—something is going to happen. Here we have this ridiculous kabuki dance going on between the Congress and the President on the budget. The President refuses to lead on the budget, and that is something that Senator Hollings and all of us here could give long speeches on.

But I am not so sure that the institutional investor is—I think the desire for short-term profits may be picking up as people get more nervous. Prove to me my pessimism is wrong.

Mr. CHOATE. Well, I would begin by saying taking an optimistic position is an unaccustomed role for me.

So, I share that.

But I come back to it for this reason. When one takes a look at the trades on the New York Stock Exchange, what one sees is a 20-year pattern where a growing proportion and a preponderance of those trades have been dominated by institutional investors. For example, in the mid-1960s what we saw was an average of nine large block trades a day. That is 10,000 shares or more. By 1980, that was up to roughly 500 large block trades a day. By 1986, that was up to roughly 1,800 large block trades per day, and more recently in 1988, this has moved up to over 3,000 large blocks trades a day.

Now, in the 1960s, what we saw in the 1950s is that though institutions only owned 5 percent of the stock, they only did 25 percent of the trades, but as their ownership has risen, as the hyperspeculation has increased, what we find is that their equity position has gone to 35 percent, but their trading value has moved up to roughly 90 percent in both value and volume. And it is these institutions, essentially 300 firms, the preponderance of these, that are now doing the majority of these trades. And moreover, when you go back and take a look, what you find is that of the 200 largest corporations listed on the New York Stock Exchange, more than half of their shares are held by institutional owners.

Now, what happens is the CEOs and the boards are naturally reluctant to sacrifice short-term earnings and quick profits because they know what the raiders, particularly in the era of the 1980s, that the institutional investors, having no loyalty to the company whatsoever, would simply get rid of the stock.

What it seems to me is a direct targeted way to deal with that short-term issue to change the expectations on the corporation is to go in straight and deal with the ways that the institutional investments themselves operate their environment. They can get by with this simply because they do not pay taxes on those trades. If, in

effect, the Congress were to set a hurdle and to say that there will be a 30 or 40 percent or 50 percent tax on their short-term trades, that would necessarily skew the whole dynamics and the whole arithmetic so that they would hold the stock a year or a year and a half.

If you introduce the element of time, then it means that the person that is making the investment has to think about when they make the investment, not simply just run it on the numbers. They have to think about what is the quality of the management of that corporation, are they investing in modernizing plant and equipment, are they taking a global view, are they putting money into R&D activities. And so, suddenly the people that are making the investment decisions are going to have to work a little harder. They are going to have to do a little research. And in the long term I think that will build in a much longer term perspective.

And it will do something else by taking this kind of an approach. It is an approach that is very market oriented. Those pension funds in institutions that have been taking a long-term view will not be affected at all by this. On the other hand, what it will mean if an institutional manager decides they want to be out of it, they can move out of it. So, there is great freedom of choice in doing this.

The CHAIRMAN. Senator Gore.

Senator GORE. Thank you very much, Mr. Chairman, and thank you for continuing our committee's focus on this broad subject. It is extremely important to have the kind of discussion we are having here today. And I really enjoyed the three statements. I think they have been usually well constructed.

Essentially what has happened is in my view, the Reagan and then Bush Administrations conducted a kind of leveraged buyout of the U.S. economy. Now, they are selling off major chunks of it to finance the interest and dipping into Social Security for additional borrowing, giving golden parachutes to every wealthy taxpayer and distracting the attention of people who might otherwise be led to look at the long-term future of our country.

And in these sobering statements today, we have had a prescription for changing this myopic, irresponsible approach. And I commend all of our witnesses and especially these two remaining with us.

Mr. Hughes, I well remember when John Young and the Council on Competitiveness first issued their prescription, and the President, having authorized the study, refused to even meet with Mr. Young to receive a copy of his conclusions. I remember because the White House refused to even provide a room for the press conference to be conducted. I happened to be at a place where it was possible to get the Congress involved to get a room so that you could present the results of this multi-year study. And I am so glad that your group has continued its excellent work, and I commend you for it.

And, Pat Choate, yours has been a lonely voice in the wilderness for so many years now. I admire greatly the tenacity you have brought to this task. It is a story that many do not want to hear. It is useful for both of you to talk about how optimistic you are, and I agree with Chairman Hollings that no one will listen unless there is a basis for optimism and hope, and luckily there is. But there is

also a cause for alarm and a need for urgency in responding to these trends which are now approaching a point where the future economic strength of our country is really threatened.

I have listened with interest to the other questions and answers, and I guess I can be most useful in focusing on a few narrow parts of the overall picture to which I think I can bring some new questions.

First of all, on your board, Mr. Hughes, is an economist named Michael Porter. He has a new book coming out. I wonder if the two of you are familiar with his most recent conclusions, namely, that the degree of competition in an industrial sector seems to represent, according to his calculations, the single most reliable indicator of how well that sector will perform in the country in which it is located. Mr. Choate, have you?

Mr. CHOATE. No, sir.

Senator GORE. Mr. Hughes.

Mr. HUGHES. I read his "Harvard Business Review" article, which summarized his findings, and I am part way through what is a very long book. It is a very rich book, and I am going to get through the rest of it.

I have thought seriously about that question of competition because many of us who have been working on trade and competitiveness for a long time have often emphasized the cooperative side of things, industrial consortia; reducing the adversarial relationship between business and government; and having workers and management take a different look at their relationship. I do not think Porter really questions any of those matters.

What he draws attention to is another aspect of how successful Japan has been in mixing cooperation and a government role, while quite self-consciously maintaining competition in their individual industries.

A friend of mine at MITI, who at one point ran their industrial competition bureau, pointed out that when they brought groups together in an industrial consortium, they were very careful to involve several of the large keiretsu. So, they were getting the best of cooperation in terms of sharing the risk and stimulating the development of a generic technology. At the same time they were building in competition right from the start so that Mitsubishi and Toshiba and Fuji Heavy Industries, or whatever the industry happened to be, would then be off and competing.

It makes me think of an economic concept that has not been fashionable lately. It is the concept of "workable competition". That is, as you look around, you don't really see too many Adam Smith sectors in the economy. Often you have a few large firms, along with a few smaller ones. The question becomes one of is there enough competition to get the job done? I think that that is part of what Porter has picked up in looking at the Japanese case.

Senator GORE. Let me ask about a second area.

Both of you have mentioned the importance of infrastructure. While we focus renewed attention on roads and bridges and railroads and ports to transport the hard goods that make up the bulk of our commerce, do you both agree that it is time to expand the definition of infrastructure to accommodate the increasing demands of an information economy requiring very large data flows

for the kinds of information processing machines that seem destined to play a more important role in our economic future? Mr. Choate?

Mr. CHOATE. I do, sir. I think we should be considering as a nation wiring every home with optic fibers. I think we should be moving into a whole array of those cutting edge infrastructure. I think at the same time it is absolutely essential that we take a look at much of our older infrastructure and move on with the process of rebuilding, strengthening, rehabing, repairing that. And I would also include as among that infrastructure our Nation's scientific establishment, our labs, our university facilities, which NSF says that we require $40 billion of back investment.

The challenge here is I think one that for 20 years, we have followed a deliberate policy of holding back monies that are collected, such as happened in the highway trust fund, and at the same time not stepping up to the demands. And so, we see a circumstance in which in real purchasing power terms, this country is investing less in infrastructure today than it invested in 1968, which was the peak year, and we find as a proportion of GNP, we have declined from about 3.2 percent of our GNP into infrastructure to a little over 1.4 percent.

The real challenge here it seems to me is how do we devise a national capital budget, a game plan, where at least the Federal Government will identify what it is going to do and then sort it out between the public and private sectors, the Federal, state and locals, and how do we find sources of revenues that are directly focused upon and dedicated to the infrastructure itself.

Senator GORE. Mr. Hughes.

Mr. HUGHES. I would share that view both in terms of taking a look at the infrastructure of the future, as well as making sure we have an adequate infrastructure more traditionally defined. In the latter sense, I have been struck by some recent work done at the Chicago Fed by an economist—and I believe his name is pronounced Aschauer—who has found a very close relationship between our decline in infrastructure spending and the decline in our rate of productivity growth.

Senator GORE. A third and final question, Mr. Chairman.

One of the few places in the Federal Government where a concentrated, focused effort to develop key technologies for the future was to be found was in DARPA, the Defense Advanced Research Projects Agency. For 16 years an individual I consider extraordinarily talented, named Craig Fields, searched out and actively supported developments which have leverage over the future. He challenged the prevailing notion of laissez faire in the relationship between government and these key technologies and engaged in a series of disputes with the ideologists of the Reagan and Bush Administrations.

The straw that evidently broke the camel's back was related to a very small investment by the Defense Department in a project to develop a gallium arsenide switch essential for the development of multi-gigabit fiber optic networks. He was fired as a result. That was transmuted into a transfer to a job that takes him out of what he does best.

I am wondering if our witnesses this morning have any comment to make on the transfer of Craig Fields?

Mr. CHOATE. Yes, I do have a couple of comments.

I am a great admirer of Craig Fields and I am saddened to see the Federal Government ultimately lose his services. I think it is a great loss to the country. At a larger level, I think his removal reflects a fundamental mistake in national policy.

What in effect we are saying as a country is that we will stand aside and permit companies in Europe and in Asia, with the support of their government, operating often in the context of cartels, to be able to seize dominance in the key technologies that will shape work and life in the 21st century. That absolutely guarantees that we are going to see dozens of industries that depend upon those generic technologies, such as DARPA worked on, find themselves in a condition of dangerous dependence. And in that dangerous dependence, what it is going to mean is those firms are going to have to tow the mark for the companies in Europe and Asia, or they are going to be denied that technology. And it also means that our companies then find themselves with the terms of competition shaped from abroad as to whether they get technologies, whether it is old technologies, the price of the particular technologies.

It is quite impossible to expect American firms to take on cartels that have their government standing behind them and that are vastly subsidized and be able to compete. The free market and classic economics has nothing to do with this. What we are really talking about is a national determination to control certain industries, and we in effect are saying as a nation that we are stepping aside on this.

Now, on one level I hate to see that happen, but on the other level, what that action does is it clearly sharpens the debate.

Senator GORE. Any comments, Mr. Hughes?

Mr. HUGHES. I did not know Mr. Fields personally, but I knew him by reputation, and as you stated, it was an outstanding reputation. Having worked for congress myself for many years, you hate to see a fine public servant treated as he was.

I would just like to add one concern about the potential institutional impact on DARPA, which has had such a superb track record over the years. I would hope that this does not translate into a chilling effect on DARPA's flexibility and imagination.

Senator GORE. Well, another senior DOD technology offical, the head of the technology monitoring group, Project Socrates, just resigned two days ago in protest.

The position of the White House is that our Nation should not stimulate the development of a leading edge technology critical to our future if we can buy it off the shelf from a Japanese company. That was the rationale for firing Craig Fields and that rationale is the reason this dispute is far more than important than the loss of one person's job. It is the loss of an argument important to America's future, and it is a great tragedy that their position here on this question reflects their position on the larger questions that you have focused on for us this morning.

Thank you, Mr. Chairman.

The CHAIRMAN. Thank you.

Senator Exon.

Senator EXON. Mr. Chairman, thank you very much.

Mr. Chairman, as one involved in this matter of foreign trade and much concerned about it over the years, I salute you once again as the Chairman of this committee for these very timely hearings. And the information that we received this morning is particularly helpful. And I assume that the Chairman will be going into more of these in the future because I really think this is the number one problem for America's future as we look forward to the 21st century. If we do not change our course, I am afraid we are greasing the slides for the slide of America into a second class economic power. I have never been really worried about a foreigner's threat from a military takeover, but I think we are set up for an economic takeover unless we are wiser in our actions than we have been in the past.

I want to get down to some very practical, on-point questions and get your suggestions on them. Maybe the first question could be a simple yes or no, but if you want to elaborate, fine.

Pat, I listened with great interest to your talking about the actions of the money changers on Wall Street. You cite the fact that the quick turnover, quick profits are bad for lots of reasons. Would not that have been made even worse had the Congress accepted the capital gains suggestions by the administration last year?

Mr. CHOATE. Yes. You would have a sell-off. When you take a look at the Treasury Department's own study that was released in I believe 1985 or 1986 taking a look at the capital gains activities in the 1970s and compare it with a tax that was proposed, what one sees is that its effect on increased growth would be roughly one ten-thousandth of 1 percent over a 50 year period of time. So, what it would seem to me is that you would initially have a surge of income, $7 billion, $8 billion, depending on whose numbers you want to use. Then you would have revenue losses as you go to the future, and the amount of benefit that you are going to get for the economy is trivial or non-existent.

Senator EXON. Let's move, if we can, to another area. I am very much concerned that our trade negotiator and our Secretary of Agriculture are much more concerned about the trading system in the world than they are about how it affects America. I think both of them would be very excellent tacticians for being a Whitey Herzog of the baseball world and knowing what is going on. But the end result might be where my favorite team, the St. Louis Cardinals, are today, in last place in the national league. You know, playing with what is right and what is wrong without keeping your eye on the ball that we would like to win is one of the problems that we have today.

You mentioned GATT. Certainly one, I think in addition to textiles, more important than steel, is America's agriculture products and the key role that those have historically played with regard to the balance of trade. I am very fearful that those two negotiators in high places that I just mentioned are relying entirely too much on GATT. We have been talking a great deal about the Japanese here. But I think the new economic community in Europe presents a very formidable challenge to America in the future in addition to the ongoing difficulty with the Japanese.

Certainly with regard to agricultural trade, one of the main problems has been the European Community has been subsidizing very heavily their agricultural interests for a long, long time, and there is every indication that they are not going to change that significantly in the future regardless of the arguments made by our trade representative and the Secretary of Agriculture.

I had lunch within the last two or three weeks with one of the ambassadors from the European Community. And I asked him what they were going to do about reducing the subsidies to agriculture over there, and he said, well, we are going to reduce them some. I said how much, 50 percent? No, more or less in the area of 10 to 15 percent.

From your perspective, given history, given the role that the European Community market is playing today, do you really believe that there is any chance whatsoever of the European Community making any significant changes for lots of reasons in their much heavier subsidization of agriculture over there than we do here in America?

Mr. CHOATE. Mr. Chairman, I think that is largely a function of what role will the agricultural community and farms play in the domestic politics in Europe. And I see nothing to suggest that they will play a less role or less volatile role. It would impose a certain amount of extraordinary pain upon that political system that I am doubtful that they will be moving to take.

As to your earlier point, I think that what our trade negotiators are doing and have done for 40 years is followed, in effect, the national strategy of trying to get the rest of the world to adopt this regime, America's trade regime. And in the process of doing that, we have subordinated trade to defense and foreign policy reasons. And we had such an easy superiority over our competitors that we could make disproportionate sacrifices. I think, by and large, what we find is that through the 1960s and 1970s and even into the 1980s, the real essence of our trade policy has been to keep American markets open and to keep the Congress pacified. When one takes a larger look, what one can see is we really have not put resources to trade negotiations and trade activities. By and large, our trade policy is shaped in response now to our need to borrow money to finance our budget deficit, to our foreign policy objectives and to our defense policy objectives.

Senator EXON. Did you have something to say on this, Mr. Hughes?

Mr. HUGHES. I was going to say, I think there are two pressures on Europe that will make it somewhat difficult for them to make agricultural concessions. The first is that in going to Europe 1992, there will be a lot of changes coming on the industrial side. They might not want to take the political and economic risks of changing agriculture in a fundamental way. The unexpected changes in eastern Europe, now central Europe, have increased the number of countries that will be seeking some sort of economic affiliation and relationship with the Common Market. Some of those countries are traditional agricultural suppliers—Rumania, Hungary, and to some extent Poland. That will add potential pressure on Common Market agricultural which would, as I say, make it more difficult for them to make concessions.

Senator EXON. Just one last question. I will put it together so both of you can comment on it.

There were two parts of the 1988 trade bill that I was very much involved in with regard to trading and our trading posture, and that was the Exon-Florio Amendment, that I assume you are familiar with. I would like to ask whether or not you feel that the administration has properly used the Exon-Florio Amendment as it was intended.

And second, as a part of that trade act, I had established in the Department of Commerce for the first time in our history our barter office. It seems to me that a barter office, since hard cash is not readily available in many of the developing and third world countries today—are we a little bit far behind the curve with regard to barter? And does not barter, rather than hard cash, present us an opportunity to hope to improve our trade policies to our advantage?

Mr. CHOATE. Well, as to the barter question, I have no expertise on that one.

On the question of Exon-Florio, I am serving as a vice chair of a committee for the Defense Science Board that will soon be issuing a report, and one of the things that we have done is taken a look at the whole question of foreign control of technology in Exon-Florio. And two or three things leap out immediately.

The first is that more staff are required to do the reviews.

Second, I think many of us were concerned that Exon-Florio was chaired by Treasury, and think perhaps it should be co-chaired so that there is an equal consideration to the economic and trade as there is to the financial concerns.

And I think finally, there would be some criticism that, as Senator Gore pointed out, that there is an attitude that it is okay, as long as you can get cheap components from abroad, in other words, that price and immediately availability is the driving force rather than thinking in the context of a long-term, strategic dimension.

The concern of many people on that committee, including myself, has been the fact, as we saw, for example, in the Toshiba affair, many American corporations found themselves, because they were dependent upon Toshiba for components, forced into the position to lobby on Toshiba's behalf even though they very much resented what Toshiba had done. That is a dangerous dependency.

Senator EXON. That indicates how far things have gotten out of whack.

Mr. CHOATE. Absolutely.

Senator EXON. Mr. Hughes.

Mr. HUGHES. The Soviet Union and former parts of the Soviet empire are not geared-up to compete effectively on world markets. They will be looking to make counter-trade type arrangements. I think it is quite useful to have a government agency that is thinking that through and taking a hard look at it. I think there will be opportunities there, but we want to be sure we make the most of it.

On Exon-Florio, I would share Pat's comments. It does seem to me—I am by no means an expert on this, although I have read a lot about it—that there has been a real reluctance, in many cases, to even conduct the investigation, let alone recommend against the sale.

There have been some interesting changes or suggestions that have come out of the application of the law. Going back to the original Monsanto sale to Huels there is widely reported to have been a side letter in which Huels commits itself to conduct research and continue production in the United States. The Huels letter goes back to one of Clyde's suggestions with regard to the access of foreign industries to medical research at American universities: You want to make sure that the research is commercialized here. So, maybe that philosophy is already one of the unintended consequences of Exon-Florio.

Senator EXON. Thank you, Mr. Chairman. Just let me make one comment.

During our extensive negotiations with Exon-Florio with the administration, it was the first time I fully understood the fear—maybe "concern" is a better word, but I think outright fear on the part of the administration, that if we dare ever do anything to get tough with foreign competition, they indeed might quit buying our treasury bills. And that is a clear indication of how far this whole system is out of whack and how vitally important it is that we have more meetings like this, Mr. Chairman, so we can at least focus the attention of the Congress on this and hopefully the American people and, through them, American business.

Thank you very much.

The CHAIRMAN. Thank you.

Senator Bryan.

Senator BRYAN. Thank you very much, Mr. Chairman. I apologize. I had to step out and did not hear all of the testimony of our distinguished panel this morning.

If I might direct a question to Mr. Choate. It is pretty clear—and you will recall I asked a question earlier of Mr. Prestowitz before he had to leave—that the Japanese are very effective at targeting for long-range strategy whether it is consumer electronics or automobiles, and they have had some remarkable success.

An area that we also enjoy a considerable trade balance that runs to our favor is in the aerospace industry. And as you will recall, the Japanese have put together an international consortium that is going to be dealing with the propulsion system of a hypersonic aircraft. I think Reagan called it the Orient Express, if memory serves me correctly.

And my question to you, Pat, is what ought our policy to be within these parameters? We have some contractual arrangements and some Federal funding that is made available to General Electric and Pratt and Whitney, which are two prime American engine or propulsion manufacturers. Now they want to participate in this consortium in Japan which will involve Rolls Royce, and I think it is Aerospatiale, the French manufacturer, and then two major Japanese companies, probably Mitsubishi and a couple of others. What ought to be the policy?

In other words, the American taxpayer is investing heavily in terms of technology with our companies, and our own companies want to then go to be part of this international consortium which I suspect in my own cynical frame of mind is not necessarily what is best for America. What ought to be the guidelines? Do we have any concerns there in your judgment? What ought we to be sensitized

to in terms of where the hell that leads us because I'm concerned that they are targeting aerospace in the 21st century just like they targeted automobiles and consumer electronics in the earlier decades of this century.

Mr. CHOATE. Well, I would start off by saying that particular industry, the aerospace industry and the aircraft industry, has produced major positive trade returns for the United States. It is one area where we really are superior, where we really have not only the technology and the know-how, and it is an area that both the Europeans and the Japanese want to be in. The Europeans have announced that they are now moving to SSS-2, a plane, 15 years from now, the middle of the next decade.

It seems to me that we should simply determine whether or not we want to be in that industry. And if we want to be in that industry, then we should undertake whatever is necessary to enable the American industry and the American people to harvest the high value-added jobs and profits that are going to be created and harvest them here in the United States.

The second thing that we need to do is take a look at the trade practices, for example, of the Japanese. Mr. Steve Schlosstein has a book that came out three months ago, and he tells a very interesting story. And part of the story is that the Japanese government turned to some American manufacturers and said very simply if you wish to sell your products in many of the countries where we are giving aid to, you will do a joint venture and share technology and know-how with us, or otherwise we will condition our aid quietly that it cannot be used to buy your goods or services.

Well, it seems to me that here's an area where the U.S. Government needs, in effect, to step up. So, what we really require on some of these industries and technologies is a policy, and some of the policy involves expenditure of money. Some of the policies may well involve permission of companies to work together, antitrust, and part of the policies may well involve the U.S. Government taking some assertive actions on trade and other policies with other governments.

Again, it is a question of saying do we want to be in this industry or not. When one takes a look toward the long term, you can just see that if you have other governments coming together and they are willing to put up billions of dollars and form consortiums, our companies cannot stand alone against that. And there is absolutely no need or reason why we should be backed out of those industries. It certainly will pay a lot for us. On just a simple economic relationship, our country can make a lot of money from this, just as we have done with agriculture, computers and other things in the past.

Senator BRYAN. Just as a follow-up question, if the Chairman will permit it, with that kind of policy perspective, how do we make sure that the technology that we pay for—that is, to the extent that a lot of the technology that we invest in in terms of government research and investment with the private sector, which I think is wholly appropriate—I would like to see frankly a bit more of that in selective areas personally. But if our companies are going to be participating in these international consortia, whether it is sponsored by the Japanese or the Germans or whom-

ever, where do we draw the line to, in effect, protect in an American proprietary sense that in effect the technology that we are paying for, whether it was the FSX, which I happen to think was a serious mistake for us, is not then transferred into this new consortia that the Japanese or the Germans or some of our other major commercial competitors are going to form so that we do not lose some of the benefit that we have gained because we are, generally speaking, ahead in those areas?

Mr. CHOATE. Senator, I think as a starting point, in the absence of a national technology policy with some fairly decent objectives and a vision for the future, the U.S. Government and American industry is left unto a series of ad hoc responses which really will not add up to much when you put it together. What is really required is a national technology policy.

And then a part of that is we really need to retnink how we are permitting a sharing of technologies through our universities with foreign governments and foreign firms. The American people and the Congress are putting up massive amounts of money. The universities, since 1980, can go in and take much of that product, patent the goods, and then turn around for $25,000 or $50,000 and sell off this technology, and for a half million dollars, some of our universities are permitting foreign firms to come in and actually go into the labs and get an advanced look.

Now, it is my understanding that much of this money has been put up to help American industry, American people, not to just simply advance the general state of knowledge. Perhaps in some cases we need to make some differentiation.

And to the point that Senator Rockefeller brought up, the country really does require some very clear thinking on how we are going to deal with some fundamental differences in intellectual property rights between this country and other countries, and particularly the Japanese. I have been very impressed in reading the various hearings on intellectual property rights that Senator Rockefeller has chaired on this whole question of patent flooding and the extraordinary cost that is involved when an American company has his technology surrounded or taken. You are talking about dealing with 200 plus patents. You are talking about fights that can go on for seven years. Texas Instruments I guess went on for 30 years. And you are talking on each of those suits, as much as $100,000.

So, we really require a technology policy, a vision, the components, and then the protection of the intellectual property rights.

Senator BRYAN. Thank you very much, and thank you very much, Mr. Chairman.

The CHAIRMAN. Thank you, Senator Bryan.

This has been outstanding. I was very interested in the presentation here.

Do you have some further questions, Jay? Go right ahead.

Senator ROCKEFELLER. No questions, Mr. Chairman, but just one observation to make with respect to Federal and university laboratories.

There was, in fact, a bill passed and there was, in fact, a bill signed by President Reagan that in any Japanese—it did not mention the Japanese, but just given the fact that there are about

13,000 Japanese researchers in this country at any given time, that where reciprocity of laboratory use was not extended by the country requesting to go into our Federal non-classified and university labs, that they could not do so. It is a law of the land. It has not been exercised.

The CHAIRMAN. Now, don't you outstanding gentlemen destroy your credibility with observations about the Competitiveness Council that Vice President Quayle has on product liability. I have been Chairman of this committee, and I have heard Vice President Quayle on space. He never has mentioned competitiveness to me. With respect to product liability, we have the Rand study of 464 production executives who said it was less than 1 percent cost to the industry. And I can go down an entire litany, but I happen to be in a state where we have two to three dozen Japanese industries. I have more West German industry, Mr. Hughes, in my little State of South Carolina than the other 49 states. And the states have product liability. That is an exercise on a political platform that was included at the last convention. It has nothing really to do with competitiveness. And with the erudition and the background knowledge that you folks have, you do not want to step off into that political nonsense.

You said, if I remember, I noted, the America industry moved from arrogance to concern to panic, and then from my experience to Mexico.

That is what is bothering me.

We have 85 percent of the press boards for digital computers in Greenville, South Carolina.

Nissan and Bosch, the Japanese and West Germans combined together for the most advanced electronic automotive engineering systems. They selected Anderson, South Carolina on account of our productivity, our technical training and skills. So, we are getting the best of the best industries still.

But then Cummings from Stuttgart that we brought in says we had a wonderful time, we hate to leave, but we have to go to Mexico. Pratt and Reed—I can just start giving the list beginning about seven years ago.

In other words, a lack of a policy, Mr. Choate, is a policy that forces competition offshore.

You might want to comment on Craig Fields. I know the administration is patriotic and they believe in the country and they believe in competitiveness. Why would they call Craig Fields' hand?

It is part of the pressure brought by the Japanese lawyers around this town. You and I know that the Japanese are better represented by 100 firms at the cost of $113 million in Washington than the American people are represented by 535 Congressmen and Senators at a salary of $52 million. They have better representation. I feel it from the Chairman's standpoint of this particular committee. If anything along this line comes up, my office fills up, and you cannot answer the calls.

What about that, Mr. Choate? They must have brought pressure on them. This public has got to understand how keen this competition is. It is not just the education. It is not just selective industries for market share alone. It is all of these things plus they are hammering in there to make sure they are looking way down the road.

And here we get a good operation like DARPA. We get an outstanding individual like Craig Fields. We go into a very, very needed technology, and yet they know they can bring the pressure on this shibboleth of industrial policy and on that alone get their attention and fire the guy. Isn't that what is happening?

Mr. CHOATE. I don't know the specifics in Mr. Craig Fields' circumstance.

But I do know that what we find is the Japanese have a very formidable political presence in this country and in this town. And you are quite correct. It is $100 million plus, and I estimate that it is substantially higher than that because we do not know the full amounts of money. Some is registered with the Foreign Agency Registration Act. Some is in domestic subsidiaries. In other cases, you have people that are paid to do trade law work. So, it is actually quite probably higher than that. But $100 million plus is more by far than any other country or any other combination of countries.

I think that what much of that reflects is that Japanese and European companies understand very fully that there are six ways to compete. One of those is better price. Another is better quality. Another is better service, better innovation, better marketing. All of our companies can do that. But there is also a recognition that there is a political dimension to economic competition, that it is possible through politics to offset price, quality, service, innovation and marketing. They devote the time and attention to it. It is considered a normal part of business in Europe and Japan. As they have come to America, they have brought that with them. It is totally legal. It is very proper. American business is creating a vacuum that they should be filling and that their competitors are filling.

We have I think some very serious problems in the question again of trade and related areas to permit a revolving door where too many of our high ranking officials too quickly become registered foreign agents. I think that demeans our country and our negotiating stance around the world, and it also a problem I think that we do not have full disclosure.

So, to me the issue is not lobbying. It is a question of what kinds of standards do we wish to have for our public service.

And second, it is the question of should we not as a people put into place the kinds of professional staffing and backup that is done by the Germans and the French and by the Japanese where you have 20 and 30 year people who come from the very best of their universities where public service is a quite honored thing, where they understand continuity, where they can take a longer term perspective, where they are not pressed for quick results. So, it seems to me we are at a point in time, as we were at an earlier point in our history, where we professionalized our military and we professionalized our foreign service, where perhaps we need a comparable cadre of people in our trade negotiations to be fully professionalized.

The CHAIRMAN. Very good. Any further comments? [No response.]

The CHAIRMAN. We are very, very grateful to both of you here this morning, and we are going to have to have you back.

Mr. CHOATE. Thank you very much, Mr. Chairman.

The CHAIRMAN. Thank you very, very much.

Mr. HUGHES. Thank you, Mr. Chairman.

The CHAIRMAN. The committee will be in recess until the call of the Chair.

[Whereupon, at 11:32 a.m., the committee was recessed, to reconvene at the call of the Chair.]

COMPETITIVENESS CHALLENGE FACING U.S. INDUSTRY

WEDNESDAY, MAY 23, 1990

U.S. SENATE,
COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION,
Washington, DC.

The committee met, pursuant to notice, at 9:37 a.m. in room SR-253, Russell Senate Office Building, Hon. Ernest F. Hollings (Chairman of the Committee) presiding.

OPENING STATEMENT BY THE CHAIRMAN

The CHAIRMAN. Good morning. The committee will please come to order.

We want to welcome you to the second of two full committee hearings this month on America's competitive position. At our first hearing on May 11 the committee received testimony about the economic strategy being pursued by Japan, our main industrial competitor. Japan, we saw, does not wear ideological blinders that say the government should never be involved in promoting industrial and economic competitiveness.

Instead of laissez faire capitalism, they have another form of capitalism with a government that actively supports the companies. They do pick winners. They do target what they consider to be the key technologies. They do target the industries of the future. In industry after industry they are winning, as is now evident from a report that came out two days ago by our Department of Commerce, "Emerging Technologies, a Survey of Technical and Economic Opportunities".

We understand that. We still have in the United States many of the most dynamic companies of the world, and we have the most productive workers; but when Japan and Europe target an industry and give it the full support of the government, then our companies are at a huge disadvantage.

The free market economists tell you that targeting is bad. They want to discuss it at GATT meetings and push other countries to abandon policies that have made these countries rich and outstandingly successful. Japan, of course, is not about to change its fundamental way of doing business. If you were the Emperor in the next ten minutes, you would not do it either because they are now, 45 years after World War II, richer than you and me. It has worked; it is working, and it is time that our economists adjust to that reality rather than pretend that the rest of the world is going to adjust to our view.

The United States needs a strategy for economic competitiveness, one that fits our values but which is also effective and carried out with vigor and determination. Our companies are willing and able to compete, but what they really need is a government that is willing and able to compete, one that is on their side and not undercutting them and burdening them further at every term.

We have two outstanding witnesses today, a successful businessman, an entrepreneur of the type we justly celebrate in this country. We want to ask him what it is like to compete when the American companies we supply are up against Japan, Incorporated.

We also are very pleased to have our President's distinguished science advisor, a distinguished man we hold with all respect in this administration. Dr. Bromley has been in office now for 16 months, and it is time for you and the administration to articulate a clear technology policy, and tell us what overall strategy the administration hopes to pursue to promote the competitiveness of U.S. industry.

In the 19th Century America did have a clear strategy, one in which the government played an active role in helping to build success stories in manufacturing, the railroads, agriculture and so on down the list. In the earlier part of this century government picked the winners in aircraft and space, and we still lead the world in these industries. The question today is whether other key technologies and industries will also receive government support or whether they will receive government indifference in the economic future. As we move from the Cold War into the Trade War our very standard of living depends upon the choices we make.

I want to yield first to the chairman of our Science Subcommittee, Senator Gore.

OPENING STATEMENT BY SENATOR GORE

Senator GORE. Thank you very much, Mr. Chairman, and thank you for your sustained leadership, not only in the set of hearings this year of which this is the second, but over the years. During the six years I have served on this committee I have been pleased to attend virtually all the hearings you have organized on this overall subject. I think it is an extremely important one, and I appreciate the chance to attend this morning.

Last week in the Science subcommittee we had a hearing on semiconductor technology and looked at a microcosm of this larger issue. We saw the same things there which we will be looking at in this morning's hearing.

I was reviewing this morning, Mr. Chairman, the report which has just come out from the Technology Administration of the Department of Commerce which we will be looking at this hearing and I find it alarming news; but not surprising because people have told us for some time that these developments were under way.

We are now told by our Commerce Department that in key technologies we are losing badly. Versus Japan, we are losing badly in advanced materials, biotechnology, digital imaging technologies, and superconductors, we are losing in advanced semiconductor devices, high density data storage, high performance computing, medical devices and diagnostics, optoelectronics and sensor technology.

We are losing and losing badly in mini-technology areas versus Europe.

In some areas such as advanced materials and superconductors, we are holding our own against Europe, only to find that we are losing badly in those same technology areas versus Japan. In one area we are holding our own against Japan, flexible computer integrated manufacturing, but we are losing badly versus Europe in that same technology.

There is only one key technology area reviewed in this whole report where we are holding our own against Japan and Europe, and that is the area of artificial intelligence. Perhaps we can use it to come up with an artificially intelligent policy on technology and science because we do not have such a policy today. We have seen Craig Fields fired, who was the only person who was really advocating such a policy in the government publicly.

I am encouraged by only one thing, and that is that Dr. Bromley is in the position he is, and there is some small, faint hope that he might yet prevail in his persistent arguments within the White House, quietly, privately, that we should change our policy. I hope that he is successful in that regard, but I am not encouraged by the President's complete inaction in this area.

Just as people now are asking questions about why over the last decade somebody did not flag the problem with the savings and loan industry and tell us these trends are bad, we have to take action or we are going to have a debacle on our hands, in exactly that way we are asking the question again this morning why does the administration not do something about the hemorrhaging of science and technology leadership from the United States and the dramatic gains at our expense on the part of Japan and Europe.

I hope this hearing this morning will take us a step closer to a realization by the administration that something needs to be done.

Thank you, Mr. Chairman.

The CHAIRMAN. Thank you very much, Senator.

Well, we are pleased to have both of you gentlemen. The full statements will be included in their entirety, and you can give those statements and highlight them as you wish.

STATEMENT OF HON. D. ALLAN BROMLEY, DIRECTOR, OFFICE OF SCIENCE AND TECHNOLOGY, EXECUTIVE OFFICE OF THE PRESIDENT

Dr. BROMLEY. Thank you, Mr. Chairman. I welcome this opportunity to appear before you and your colleagues this morning to discuss the administration's views on U.S. industrial competitiveness and the administration's policies concerning technology and competitiveness. This whole issue of competitiveness of our national industrial base is, of course, of paramount concern to the administration as it is to you in the Congress. In fact, I doubt that there is any more important issue that we must address jointly.

What I would like to do with your permission, Mr. Chairman, is to leave, as you said, the formal testimony for the record, to make a brief oral statement, and then specifically to address the six excellent questions that you, sir, included in your letter of invitation.

The CHAIRMAN. Very good.

Dr. BROMLEY. Let me then begin with an opening set of remarks.

I would submit to you, sir, that there is general agreement that global competitiveness and national security are now tightly interwoven, in that our national defense posture depends on our continuing economic vitality. We are in an era where international economic competition poses, as Senator Gore has emphasized, a formidable challenge. The administration has taken a number of positive actions to respond to that challenge.

We in this administration believe that it is essential that the actions of the Federal Government recognize and use the strengths of our economic system more effectively to remain competitive while at the same time refraining from actions that would distort our basic system of free enterprise, which in the last analysis we believe to be our ultimate strength.

Important as the role of technology is in competitiveness and in a national strategy that is successful in industrial competitiveness, we believe that it cannot be based solely on technology. Our strength in technology has not prevented the steady erosion in our market share in many industries, as you, sir, have indicated.

As each segment of these businesses mature, the advantages quickly shift from the innovator to the efficient producer, and many people would argue that the Japanese are the most efficient producers on our planet today. Many factors have contributed to Japan's success as a producer, but none, in my opinion, is more important than its persistently high rate of capital investment.

Many analyses imply that our problems in competitiveness reside very largely in the areas of manufacturing and process. I do not believe that that is the case, Mr. Chairman. They may show up in these areas, but they originate in much deeper structural problems that are not going to be easily resolved. There will be no facile, short-term solutions to our competitiveness challenge. The problems are complex, they are multifaceted, and if they are to be solved, actions, we believe, must be taken on many fronts involving all components of our society.

For the Federal Government, the challenge is to develop and exercise intelligent, visionary leadership emphasizing the long-term economic vitality of this Nation.

My prepared statement, Mr. Chairman, covers a number of the activities that the Bush Administration has supported over the past 16 months that we believe will enhance U.S. economic competitiveness. I will not go through them in detail today except to say that they cover the spectrum of activities usually associated with an appropriate role of the Federal Government in technology areas.

First and foremost and on the broadest level, the government has the responsibility to foster a macroeconomic climate that makes it possible for industry to invest in the technology development and manufacturing processes that it needs to remain competitive. I have called this "incentives for the private sector." This means bringing down the Federal budget deficit and reducing the cost of capital. This has been a top priority of the Bush Administration and remains so today.

Fiscal policies can be used in other ways to encourage private R&D investment. For example, the Bush Administration is working

to reduce the capital gains tax and to make permanent and enhance the tax credit for research and experimentation. In my prepared statement I have detailed for you many of the other areas in which the administration is working with Congress and our trading partners to provide the economic climate in which U.S. industries can thrive.

The second area where the Federal Government is and must be a major player, I would submit, is education and training. The administration's current budget proposal to Congress for fiscal year 1991 would result in direct expenditures of over $1.5 billion for science and mathematics education activities in five Federal agencies. These programs are in addition to the training provided to thousands of graduate students supported through Federal competitive research and development grant programs.

Clearly, too, Federal R&D support plays a major role in economic competitiveness. Investments in research and development provide both direct and indirect productivity benefits for society. R&D yields new knowledge, processes, technologies and products that over the long term result in economic growth and improved quality of life for all Americans.

Traditionally, the Federal Government has supported R&D for two reasons. The first is to meet its own direct needs, needs where it is the principal consumer, such as in defense and in civilian space-related research and development. Funding levels and decisions are made on the basis of government objectives, needs and requirements.

However, the government relies principally on the private sector to undertake the development process and encourages these activities to be managed in such a way as to optimize commercial application of this research and development.

The second category of R&D requires Federal support in the interest of public welfare, but the private sector is without sufficient incentives to capture enough of the benefits to make private R&D investment justifiable.

Indeed, the administration's budget proposes to allocate a total of over $71 billion for all R&D including basic research and research facilities in fiscal year 1991, an increase of $4.5 billion or 7 percent over the fiscal year 1990 levels. Within this total, civilian R&D would increase by 12 percent, and defense-related R&D would increase by 4 percent.

In particular, of the approximately $15 billion proposed for civilian applied research and development, a significant percentage—in the billions—would be allocated to developing advanced technologies such as energy technologies, robotics, high performance computing and other technologies.

On the defense side, the budget proposal for the Department of Defense technology base, including the DARPA budget, but excluding SDI funding, is nearly $5.6 billion for the fundamental, basic, applied and developmental research that underpins our future defense systems. The major high technology areas of defense funding include high definition display technology, manufacturing and materials technology, artificial neural network technology, and support for SEMATECH, which focuses on semiconductor manufacturing technologies.

Thus, Mr. Chairman, it is clear that the Federal Government currently supports a very large amount of technology development, and it should also be recognized that previous Federal R&D investments have been very successful in developing technologies required for defense, for space, and for other important civilian applications related to agriculture, health and aeronautics.

The administration believes that the Federal Government should also continue to participate with the private sector in developing generic technologies that are important in both governmental and commercial applications. President Bush pointed out to the American Electronics Association in March of this year, and I quote, "This administration is committed to working with you in the critical precompetitive development stage where the basic discoveries are converted into generic technologies that support both our economic competitiveness and our national security. Here again we can help to level the international playing field on which you compete."

The rationale for investing in these enabling technologies is essentially the same as that for investing in basic research. Individual companies cannot bear the costs and risk of such investments alone. Examples include certain materials technologies, where I would include superconductivity; information technologies, where I would include the whole spectrum of activities in high performance computing; and biotechnologies, for example the scale-up process involved in bioprocessing.

The transfer of Federally funded technology to industry must be improved. It can help to make U.S. firms more economically competitive. Technology transfer has become part of the international vocabulary, but I believe that that label is fundamentally misleading. It suggests that a specific technology can be identified, isolated, packaged at one place—where it was developed, for example—and then transferred to an entirely different place where it could be unpackaged, implemented and exploited in an entirely different environment. Nothing, I would submit, could be further from the truth.

Technology is only transferred from, by and to adequately trained persons, and it is essential that our technology transfer system have an adequate base of trained personnel prepared to move with the technology and to accept and implement it at the receiving end.

This administration believes that the government must make R&D activities at Federally supported labs more relevant and more accessible to the private sector, particularly through collaborative agreements, and we believe that such efforts should be guided by the potential users, which is a significant change.

Each of the Federal agencies has a variety of directed initiatives and mission already under way and are planning others. For example, today we have roughly 200 active, cooperative research and development agreements between the Federal Government, the Federal laboratories and private companies. We are also beginning to see some remarkable collaborative arrangements. The $11 million DuPont/Hewlett-Packard/Los Alamos joint venture in high temperature superconducting materials and applications, in which the

two private sector companies are investing over $7 million, I believe is a good illustration of these new arrangements.

The final area where the Federal Government can make a contribution, in my opinion, involves State activities. Technology outreach and technology transfer initiatives at the State and regional levels are playing an increasingly important and cost effective role in helping U.S. businesses, and especially small businesses, regain their competitive edge. These State activities, as you know, sir, take a variety of forms, including direct technology transfer programs, university-based programs, R&D grant programs, research parks, financial assistance programs, incubator facilities, and so on.

Currently there are three major Federal programs implemented through the Department of Commerce that interact directly with State and local technology initiatives. The Boehlert-Rockefeller Extension Program provides technical assistance for State technology outreach and Federal technology to solve their technological problems and has been extremely successful.

I want to emphasize, Mr. Chairman, how important I believe cooperation is between my office, my staff, and that of the Department of Commerce. We have a close working relationship. It has been strengthened substantially by the recent addition of Dr. Robert White as Under Secretary of Commerce. It has been a pleasure working with him, and that cooperation will grow and expand.

The new Advanced Technology Program that has been initiated in the Commerce Department will assist U.S. businesses in accelerating the early-to-mid-stage development of generic technologies that have a potential to modernize manufacturing or to commercialize more rapidly significant new scientific discoveries. It will aid in leveraged companies entering into contracts, cooperative research agreements and joint ventures and, where appropriate, will help involve specific Federal laboratories in such agreements.

Finally, let me say that the Department of Commerce's Regional Manufacturing Technology Center Program—one with which you, Mr. Chairman, are very familiar because the center in your state is one of the models of success in this program—is a technology transfer operation designed to break down the barriers faced by small and medium sized manufacturers in adopting new technology. The program works with individual local manufacturers, community colleges and technical institutes to determine individual technology needs, to develop technology upgrade plans and to train the local work force in the use of these new manufacturing tools.

That, Mr. Chairman, will complete my opening statement. With your permission, I would then like to turn to the specific questions that you have asked. But at the risk of repeating myself I want to close by reiterating that the challenge for the Federal Government at this time, in this administration, is viewed as that of developing, stimulating and exercising intelligent and visionary leadership that emphasizes long-range U.S. economic vitality over special interests. Above all, by its words and actions the Federal Government must make clear to all, and particularly to the U.S. industrial community, that the issue of U.S. industrial competitiveness is among the very highest of its priorities for the 1990s.

[The statement and questions and answers follow:]

TESTIMONY OF THE HONORABLE D. ALLAN BROMLEY
DIRECTOR, OFFICE OF SCIENCE AND TECHNOLOGY POLICY
EXECUTIVE OFFICE OF THE PRESIDENT
BEFORE THE
COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION
UNITED STATES SENATE
WASHINGTON, D. C.

Wednesday, May 23, 1990

Mr. Chairman, I am pleased to have this opportunity to appear before your committee to discuss this Administration's views on U.S. industrial competitiveness and the Administration's policy regarding technology and competitiveness. The issue of industrial competitiveness is a matter of great concern to me both the Administration and our respected associates in Congress. There are few issues more important for us to address jointly than U.S. economic competitiveness. On any number of occasions, I have stated clearly my intentions to work cooperatively with Congress on such matters.

There is general agreement today that our national defense posture depends on our continuing economic vitality. We are in an era of increased international economic interdependency and increasingly stronger technological capabilities of our industrial competitors. We, in this Administration, believe it is essential that we recognize and use the strengths of our economic system more effectively to help U.S. firms remain competitive while at the same time refraining from actions that might distort our basic system of free enterprise which is our ultimate strength.

One of our greatest strengths is our infrastructure for research and development. We have a culture that prizes innovation, a university system superior to all others, an open and hospitable society that attracts the best scientific minds and inventive talents of the world, a business climate that encourages innovative enterprises, and a financial system that provides the opportunity for such new enterprises to grow quickly into major businesses. Historically, private industry in this country has proved itself the best in the world at converting the results of basic research into commercially successful products. Thus, it is not surprising that our technology base is the strongest in the world. We lead wherever innovative technology is more critical than production efficiency.

Industrial competitiveness depends on many factors other than technology. Our strength in technology has not prevented a steady erosion in market shares of U.S. companies in many industries. As each segment of these businesses matures, the advantage quickly shifts from the innovator to the efficient producer. Many people would argue that

the Japanese are the most efficient producers in the world today. Many factors have contributed to Japan's success as a producer, but none is more important than its persistently high rate of investment. Nor is Japan the only example where a high rate of capital investment pays off. Countries in Europe and the Pacific Rim have also benefited from a high investment rate. However, with its proven human resources and successful tradition in manufacturing, the U.S. can maintain its leadership. But, to do so, all elements of our society must be willing to recognize that while we possess many strengths and assets, problems do exist, and that we must, and can, mobilize our resources and solve them.

Many analyses imply that our problems in competitiveness reside entirely in the areas of manufacturing and process. They don't. They may show up in these areas, but they originate in much deeper structural problems that are not going to be easily resolved. Some of the weaknesses--some perceived and some real--of the U.S. system in international competition would include:

- The cost of capital in the United States is higher than for our major competitors, as a result of our low savings rate and high budget deficit;

- There is an emphasis on short-term returns on investments and a reduced willingness to take technological risks, especially in large corporations and in the financial community;

- Other countries are outperforming the United States in transforming research discoveries into high-quality products and into processes for designing, manufacturing, marketing, and distributing these products;

- The quality of the technical workforce is declining in terms of education, training, and the flexibility to adapt to technological change;

- There is a lingering wariness of company-to-company cooperation brought about in part by antitrust fears, as well as a negative attitude in some U.S. corporations toward technologies developed elsewhere; and

- The coupling between federal laboratories and industry is weak, particularly with small- and mid-sized companies that could benefit most from federal assistance, and too often, an attitude of mutual distrust exists that inhibits any effective cooperation between industry and government.

As you can tell from this partial list, there will be no facile, short-term solutions to our competitiveness challenge. The problems are multifaceted and complex. If these problems are to be solved, actions must be taken on many fronts involving all components of our society. For the Federal Government, the primary challenge is to provide an environment conductive to the long-term economic vitality of the nation.

Incentives for the Private Sector

The Administration is supporting a wide range of policies to remove obstacles to maintaining our economic competitiveness. These do not necessarily fall into the stark categories of massive government subsidies of favored industries, on the one hand, or, a total "hands off" approach by the Federal Government, on the other. This Administration strongly believes that the real choices lie in other directions.

First and foremost, on the broadest level the government has the responsibility to foster a macroeconomic climate that makes it possible for industry to invest in the technology development and manufacturing processes that it needs to remain competitive. This means increasing national savings and reducing the federal budget deficit to bring down the cost of capital. This has been a top priority of the Bush Administration as evidenced by our proposals for Family Savings Accounts, our proposal to ensure that social security surpluses are used to reduce debt rather than increase spending, and our call for a budget summit with Congressional leaders.

Fiscal policies can also be used in other ways to encourage private R&D investment. For example, the Bush Administration is working to reduce the capital gains tax and make permanent the enhanced tax credit for research and experimentation.

A more favorable legal environment is another important factor. Product liability reform is a top priority for the Administration. In addition the Administration has recently proposed changing antitrust laws to encourage companies to enter into joint production ventures and to limit punitive damage awards which increase, immeasurably, the financial risk to companies entering into such ventures. These collaborations, from R&D through joint production ventures, provide the means for companies to share risk and pool resources, and they are common in other countries. Such ventures are also common between U.S. firms and foreign firms. But this country has been slow in adjusting to the new reality that we are now competing in a global marketplace.

Similar legal changes can be made in patent law. In the Uruguay Round of trade negotiations the Administration is pursuing improvements in protecting of intellectual property in the international marketplace. The Administration is also seeking to increase of harmonization between regulations here and abroad to allow firms to compete more effectively.

Education and Training

The second area where the Administration is pursuing improvements is in education and training. The United States needs to strengthen the entire educational process to ensure that those entering the workplace will have the necessary knowledge, comprehension, and problem solving skills for the highly technical content of the daily living and working environment of the future. Critical among industry concerns is the anticipated shortfall of scientists, engineers, and technicians.

The President's Education Summit was intended to catalyze a national consensus on improving education, including science and mathematics education. One of the national goals that emerged from this summit states that: "By the year 2000, U.S. students will be first in the world in science and mathematics achievement." Achieving such a goal will require a broad-based approach involving business, academia, educational organizations, and state and local governments.

The Federal Government, itself, must assume an effective and appropriate role in supporting the states, localities, and universities as they improve science and technology education. In this effort, a particular emphasis must be placed on improving our educational capabilities related to manufacturing and other high technologies. The Administration's current budget proposal to Congress for fiscal year 1991 would result in direct expenditures of over $1.5 billion for science and mathematics education activities in five Federal agencies. These programs are in addition to the training provided to thousands of graduate students supported through Federal competitive R&D grants programs.

Federal R&D Responsibilities

Investments in research and development (R&D) provide both direct and indirect productivity benefits for society. R&D yields new knowledge, processes, technologies and products that, over the long term, result in economic growth and improved quality of life for all Americans.

Traditionally, the Federal Government has supported R&D for two reasons: first, to meet its own direct needs -- where it is the principal consumer -- such as defense and civilian space related R&D; and, second, to meet broader national needs such as new and better means of diagnosis and treatment of disease, agricultural productivity, and pollution clean-up.

In the first case where the Federal Government is the ultimate consumer for the R&D results, funding levels and decisions are made on the basis of Government objectives, needs, and requirements. However, the Government relies principally on the private sector to undertake the development process and encourages these activities to be managed in such a way to optimize commercial applications of the R&D as well.

The second category of R&D requires Federal support in the interests of the public welfare where the private sector is without sufficient incentives to capture enough of the benefits to make private R&D investments. Federal support for basic research, especially at universities, is the prototypical, essential investment in the Nation's scientific and technological future, including its future scientists and engineers. This Administration has proposed increasing support for basic research by $1 billion, or 8 percent, to over $12 billion in FY 1991. Indeed, the Administration's budget proposes to allocate a total of over $71 billion for all R&D, including basic research and research facilities in FY 1991, an increase of $4.5 billion or 7 percent over FY 1990 levels. Within this total, civilian R&D would increase by 12 percent and defense related R&D would increase by 4 percent.

In particular, the Administration has proposed approximately $15 billion for civilian applied research and development support, a significant percentage of which would be allocated to developing advanced technologies such as energy technologies, robotics, high performance computing, as well as other technologies. On the defense side, the Department of Defense technology base budget proposal including the DARPA budget ($1.1 billion) but excluding SDI funding, requests nearly $5.6 billion for fundamental basic, applied and developmental research that underpins our future defense systems. The high technology areas of defense funding include high definition display technology, manufacturing and materials technology, artificial neural network technology, and support for SEMATECH which focuses on semiconductor technologies. Thus, it is clear that the Federal Government currently supports a great deal of technology development; and it should also be recognized that previous Federal R&D investments have been very successful in developing technologies required for defense, space, and other important civilian applications related to agriculture, health, and aeronautics.

This Administration believes the federal government should continue to participate with the private sector in precompetitive research on generic technologies that are important in both governmental and commercial applications. These technologies have a wide variety of commercial applications; however, no single company can capture enough of their benefits to justify investing an adequate amount of R&D in them. Examples of areas in which opportunities for precompetitive research might exist include certain materials technologies (such as superconductivity), information technologies (such as high performance computing), and biotechnologies.

In a speech to the American Electronics Association in March, President Bush pointed to the importance of these technologies. He said, "This Administration is committed to working with you in the critical precompetitive development stage where the basic discoveries are converted into generic technologies that support both our economic competitiveness and our national security. Here again we can help to level the international playing field on which you compete."

Transfer of Federally Funded Technology

Technology development by the federal government is one contributor to our international competitiveness, but of course it is far from the only one. Even the other federal actions I mentioned earlier cannot guarantee our international industrial standing. Only industry itself, can do that. However, technology transfer from our Federal laboratories to the private sector, particularly to small and medium sized businesses, can also make a contribution to our economic growth.

Technology transfer has become part of the international vocabulary; but that label is fundamentally misleading. It suggest that a specific technology can be identified, isolated and packaged at one place; e.g., where it was developed--then transferred to an entirely different place where it can be unpackaged, implemented and exploited in an entirely different environment. Nothing could be farther from the truth.

Technology is only transferred from, by and to adequately trained persons and it is essential that our technology transfer system have an adequate base of trained personnel prepared to move with the technology, and to accept and implement it at the receiving end.

The United States has created and nurtured the finest research and development establishment in the world through its combination of government, university and industrial laboratory systems. The Federal Government's laboratories, in particular, embrace an astonishing breadth and depth of the best science and technology to be found. This base of knowledge represents one of our most valuable national assets. However,

a technology base is unlike many other assets: it must be put to use in order to be valuable. This Administration believes the Government must make R&D activities at Federally-supported laboratories more relevant and accessible to the private sector, and, that such efforts should be guided by the potential users.

The Federal Government has a relatively poor track record where it has invested in civilian technology without close involvement at the outset from potential users. If industry does not perceive the need, or, is not interested in co-investing in research, there is little point in the government's engaging in technology push. That is a lesson we have learned from past history. Thus, in order for industry-government cooperation -- that we have been talking about for years -- to become a reality, we need articulate and statesmanlike leadership from industry to set appropriate objectives for the cooperative endeavors of industry-Federal Laboratory-university consortia.

The Federal government, in turn, will encourage the formation of industry-Federal and industry-Federal-university consortia as well as facilitate the access by U.S. industry to Federal Laboratories within the broad, flexible Federal guidelines established by previous legislation. The Federal Government will also develop mechanisms to expedite the diffusion of the results of Federally supported R&D to industry, including support of co-operative R&D agreements for spin-off technology opportunities identified by industry, active licensing of inventions, and removing barriers to commercial development and marketing of Federally developed computer software.

Technology transfer is, and will continue to be, an integral part of every Federal laboratory's mission regardless of the specific research projects undertaken. Many Federal research programs are undertaken primarily to meet Federal program needs, not to develop technology, per se. Federal laws and policies now in place also make it the responsibility of every Federal technology manager -- defense or civilian -- to consider the commercial ramifications of the work they are supporting and to try to encourage its commercial potential. Obviously, some research has more technology development/transfer potential than others. Examples include research to promote alternative sources of energy, biomedical research, space exploration, robotics, superconductivity, and semiconductor research.

A particular example of a mission-oriented technology transfer initiative is the Department of Energy's (DOE) Precision Manufacturing Technology (PMT) Program. This program will transfer back to industry modern technological methods and skills for precision fabrication of discrete parts made from metals and advanced materials.

In return, DOE will then have the ability to procure from U.S. sources as well as foreign sources, components of weapons systems and other projects requiring such advanced technologies for manufacture.

Each of the Federal agencies also have a variety of directed initiatives in mission areas already underway and are planning others. For example, today we have roughly 200 active cooperative research and development agreements between the Federal laboratories and private companies which indicates that the companies involved believe in the potential commercial viability of the technology they are co-developing. We are also beginning to see some remarkable collaborative arrangements: the $11 million DuPont/Hewlett-Packard/Los Alamos National Laboratory joint venture in high temperature superconducting materials and applications, in which the two companies are investing over $7 million, is a good illustration of these new arrangements. Another unusual joint research effort is the Biotechnology Research and Development Consortia involving the University of Illinois, a U.S. Department of Agriculture laboratory, the State of Illinois, and six different U.S. companies.

Here it is important also to highlight the National Institute for Standards and Technology's (NIST) measurement and standards program. It is particularly valuable to the nation's high technology businesses because companies rely for commercial success on the existence of a common technological infrastructure which includes test methods, measurements, evaluated data, and standards of execution and performance. The fundamental research conducted by NIST in collaboration with industry provides this reference base.

The high technology industry's requirements for new measurements and standards, however, are changing at an ever increasing pace so that now there are not just industries without adequate measurements and standards, but there also exists entirely new technologies for which there is no standards base at all. Without these common national standards, U.S. firms will continue to struggle to compete with foreign firms that are producing high quality products embodying new technology at competitive prices. The measurements and standards process of the NIST should continue to be managed in such a way as to promote the integration of new standards with the existing U.S. industrial infrastructure.

Other NIST research programs with substantial civilian technology development/transfer potential include a measurements, reference data, standards research and services program as well as a new Advanced Technology Program aimed at assisting business in developing precompetitive, generic technologies; and an Advanced Manufacturing Program intended to increase the dissemination of new

manufacturing technologies within industry, particularly small business. In addition Commerce's National Technical Information (NTIS), through its Committee for the Utilization of Federal Technology, is working with Federal agencies and their laboratory to gather information for industry about selected Federal technology programs having immediate practical value for these industries.

State Activities

Technology outreach and technology transfer initiatives at the state and regional levels are playing an increasing role in seeking to help U.S. businesses -- especially small businesses -- regain their competitive edge. These state activities take a variety of forms, including direct technology transfer programs, university-based research programs, R&D grant programs, research parks, financial assistance programs, technical and managerial services, incubator facilities, R&D tax incentives, and worker training assistance.

The Federal Government should be aware of these activities and should assist and encourage states to develop programs that take into account the individual state characteristics. For example, the Federal Government should provide a focus for information from the highly successful local programs that could be transferred to areas in other states that need to initiate similar activities. In addition, on-going Federal programs in such areas as education, training, the national infrastructure, and regional generic technology centers should, where appropriate, leverage state initiatives in a timely way to optimize their effectiveness.

Currently, there are four major Federal programs, implemented through the Department of Commerce's Technology Administration that interact directly with state and local technology initiatives. The Boehlert-Rockefeller Extension Program provides technical assistance to state technology outreach programs throughout the U.S. to help small and medium-sized businesses identify, access, and apply appropriate Federally developed technology to the solution of their technological problems.

The new Advanced Technology Program (ATP) will assist U.S. businesses in accelerating the early to mid-stage development of generic technologies that have the potential to modernize manufacturing or to commercialize more rapidly significant new scientific discoveries. It will aid and leverage companies entering into contracts, cooperative research agreements and joint ventures, and, when appropriate, help involve specific Federal laboratories in such agreements.

The Regional Manufacturing Technology Centers (MTC) program is designed as a technology transfer operation designed to breakdown the barriers faced by small and medium-sized manufacturers in adopting new technology by working with individual local manufacturers, community colleges, and technical institutes to determine individual technology needs, develop technology upgrade plans and train the local workforce in the use of these new manufacturing tools and methods.

Finally, the Department of Commerce is currently developing a plan to make available through its Clearinghouse on State and Local Initiatives in Productivity, Technology and Innovation, all information it has obtained on the various state and local initiatives relating to technology. Future plans involve a more efficient and wide-spread collection and dissemination of such information as well as more efficient means for interested parties to access this data base.

Mr. Chairman, this statement outlines in a descriptive way what I believe are the main elements in the Administration's current policies and programs related to national economic competitiveness. That completes my prepared statement.

QUESTIONS OF THE CHAIRMAN AND THE ANSWERS THERETO

QUESTION 1: **I would like to ask two questions regarding Federal spending in support of industrial development. First, while the Organization for Economic Cooperation and Development (OECD) defines categories for research and development (R&D) spending, is it not also true that each government decides for itself how much R&D money it spends in a given category in a given year? For example, am I correct in saying that the 0.2 percent figure that I cited for U.S. support for industrial development in 1987 was a number determined by the U.S. government and not by OECD? Second, is this 0.2 percent figure accurate, given that OECD defines this category as government R&D spending whose primary purpose is to help commercial industrial development?**

ANSWER: The reported 1987 level of 0.2 percent of U.S. Federal Government R&D going to industrial development is from OECD data supplied by the U.S. Government on Federal budget appropriations for R&D by socioeconomic objectives. We believe that the industrial development category is not an accurate representation of the share of the Federal R&D budget that benefits U.S. industry. (The OECD categories reflect a country's philosophy, not just allocations of R&D funds that might benefit industry.) To suggest that the U.S. devotes only 0.2 percent of Federal R&D to industrial development misrepresents U.S. activities. These OECD figures fail to reveal that R&D that is allocated to meet other missions under other categories, e.g., health, energy, agriculture, defense, civil space, and advancement of knowledge, also leads to industrial development in the form of new products and processes that have non-governmental

applications. (Examples are aerospace and biotechnology.) In addition, industry performs much of the R&D reported in these other categories. (See enclosed chart.)

The Administration expects that the U.S. Government funding of R&D for industrial development reported to OECD will remain a small share of total Federal R&D budget. However, we believe that the entire Federal R&D budget contributes to economic growth in some manner. In particular, as I indicated at the hearing, a quick look at the proposed Bush Administration budget proposal for FY 1991 shows that well over $5 billion is expended directly for supporting high technology research and development. And, in excess of $15 billion is proposed to support non-defense applied research and development in FY 1991. It is our belief that over the long term all such support helps the U.S. commercial industries because even if the product-specific applications need customized work, technologies are often built on a common knowledge base to which R&D in mission agencies contributes.

QUESTION 2: **I agree with you that Federal agencies with missions in such areas as defense, health, space, and energy generate spinoffs with commercial significance. However, with a few exceptions, mission agencies do not systematically support the development of technologies helpful to commercial industry. Commercial concerns are secondary to their main government missions. How appropriate, therefore, is it to rely primarily on the mission agencies to develop the generic technologies needed for U.S. commercial success?**

ANSWER: **As was pointed out in my testimony and as you agree, mission agencies do support a great deal of R&D that generates spinoffs with commercial significance. The U.S. pharmaceutical industry, for example, has stated that little change is needed in the structure of intramural and extramural R&D support of the health sciences. DARPA has been very successful in finding both militarily-relevant and dual-use technologies and, thus, requires no additional comment. NSF recently published a study showing that it was supporting work at universities in essentially all areas identified in the recent Department of Commerce report on Emerging Technologies and the Defense Department's Critical Technologies report. Conscious efforts are being made in DOE, USDA, NASA, and DOC laboratories to develop programs that will benefit U.S. industry and, indeed, lead to collaborative interactions. This is not to say that other efforts of a stimulative and cooperative nature should not be initiated. A major objective of the rejuvenated Federal Coordinating Council for Science,**

Engineering, and Technology (FCCSET) is to stimulate and coordinate cross-cutting generic technology programs across agencies.

For the President's FY 1991 budget proposal to Congress a first cut was made at understanding how many of these generic technologies were being funded, and at what levels. These data and similar information on other areas of generic R&D being supported by the Federal government will continue to be refined in the President's FY 1992 budget proposal.

QUESTION 3: **Page 85 of the President's budget for fiscal year (FY) 1991 lists a $1.521 billion request to support five years of advanced technology. Could you please supply two pieces of information regarding this request? First, for each of the five technologies, how would the requested money be divided among Federal agencies? Where would the money go? Second, and related, how much of the requested money is intended primarily to support commercial industrial development, and how much is primarily for the support of government missions? For example, are the new funds requested for robotics mainly intended to support very specific space operations or to help general industry develop new factory automation?**

ANSWER: The attached table shows a breakout by agency of the FY 1991 budget request for five advanced technologies. As noted on the table, these figures are estimates based on a one-time survey and do not include data from classified programs or total systems projects even though the advanced technology R&D supporting a given program or project may be unclassified. In a systems project using a variety of different technologies, R&D on the component parts of the system is usual, but is not budgeted separate from the rest of the project activity. It is also difficult to arrive at the true numbers because R&D on advanced technologies often not identified as a line item in the agency accounting system and because of potential omission or possible "double-counting" across overlapping technology areas. An exception is high performance computing for which an interagency working group has been in place for several years. This working group has developed a reliable, internally consistent set of budget

figures for high performance computing in the six agencies involved.

The funding thus far identified for advanced technologies is categorized by the following descriptions:

- o Advanced Imaging Technologies
  - Signal processing
  - Flat panel displays
  - Optical fibers
  - Networking/Transmission
  - Optical storage disk
  - 3-D computer graphics
  - Sensors
- o Robotics
  - Sensors
  - Sensor processing
  - Actuators
  - World model
  - Task decomposition
  - Value judgments
  - Group behavior
- o High Performance Computing
  - Hardware systems
  - Software and algorithms
  - Networking
  - Infrastructure
- o Semiconductors
  - Materials
  - Radiation hardening
  - Device speed
  - Energy conversion
  - Integrated devices
  - Fabrication

- o **Superconductivity**
  - **Enhancing basic knowledge**
  - **Bulk superconductors**
  - **Electric/thin film superconductors**
  - **New materials**
  - **Standards**

All of this R&D covers the same range of objectives as the rest of Federally-supported R&D. Some of it is basic research that is widely diffused within the broad base of U.S. science and technology. However, most of it is either research on pre-competitive generic technologies that have the potential to contribute to a broad range of government and commercial applications or development of specific products for government mission requirements which may, or may not, have spinoffs to the private sector. A small part of it addresses specific industry problems.

The Federal Government supports R&D for two reasons: to meet its own direct needs where it is the principal consumer, and to meet broader national interests for the public welfare where the private sector is unable to capture sufficient benefits to make private R&D investments economic. Where the Federal Government is the ultimate consumer for the R&D results, funding levels and decisions are made on the basis of Government

objectives, needs and requirements. The second category of R&D includes Federal support for fundamental scientific research, which is the prototypical, essential investment in the Nation's scientific and technological future. This fundamental research is a necessary part of the knowledge base required both for the Federal Government to meet its own direct needs in the future and for the private sector to create new products and processes. There are no estimates that give a dollar breakout of Federal R&D on advanced technologies for each of these categories.

DEVELOPING ADVANCED TECHNOLOGIES

FY 1991 Proposed Budget Authority ($ Millions)*

Agency	Advanced Imaging Technologies	Robotics	High Performance Computing	Semi-Conductors	Super-conductivity
DOC	12	9	2	8	5
DOD	99	20	163	420	69
DOE		7	63	54	104
DOI		6			
NASA	2	133	60		8
NSF	5	17	181	55	29
TOTAL	118	192	469	537	215

* These are estimates only and are subject to the following uncertainties:

1. The estimates are based on a one-time survey.
2. Classified programs are not included
3. There may be gaps and redundancies.
4. Changes in accounting categories.

QUESTION 4: **I was pleased to hear your statements regarding the National Institute of Standards and Technology (NIST) and its new activities, including the Advanced Technology Program and the Manufacturing Technology Centers. What role do you envision NIST and its programs playing in the future with regard to (a) the creation of new generic technologies and (b) assistance to companies, especially small companies, in using new technologies?**

ANSWER: The basic purpose of the Advanced Technology Program (ATP) is to assist U.S. business in carrying out R&D on pre-competitive generic technologies. The ATP should focus on reducing technical uncertainties that are barriers to investment by the private sector. Once technical uncertainties are sufficiently reduced to permit assessment of commercial potential or development of application-specific prototypes, the private sector should assume full responsibility for supporting these ATP projects.

NIST's role in the Manufacturing Technologies Centers (MTC) Program, as the program manager and catalyst, is to support enhancing the productivity of small and medium-sized businesses by technological means. NIST is gaining extensive experience with technology transfer of advanced manufacturing systems to small and medium-sized business. Key to this effort is a "hands-on" working relationship through the MTCs with small business implementing advanced technology in small shops, providing guidance on work force training, performing "technology surveys" and demonstrating available technology to small business.

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QUESTION 5: **When you testified at the Science Subcommittee's May 17 hearing on semiconductors, you said that Administration economists prefer to respond to foreign targeting and associated research support by trying to persuade trade negotiators to eliminate all "subsidies" for research. However, the testimony we heard in this Committee on May 11 from experts on Japan showed that the Japanese are highly unlikely to change their successful formula. If the Administration is unsuccessful in current trade negotiations, what will it do next? In economics terminology, does the Administration have a "second best" solution for responding effectively to foreign targeting? Or will the Administration choose not to respond to these foreign tactics?**

ANSWER: A fundamental role of the Federal Government is to provide an environment conducive to a thriving and forward-looking economy. In the current Uruguay Round of multilateral trade negotiations, the Administration is seeking to reform and revise international subsidy practices of all GATT participants. In the area of foreign R&D programs focused on key technologies, the U.S. goal is to obtain national treatment, so that there is no discrimination against U.S. firms but rather that all firms must meet the same criteria for participation.

We are also aggressively pursuing concerns of American producers regarding limits on market access with our trading partners and are prepared to take necessary actions to ensure that our rights under existing and future trade agreements are not impaired. There is not, however, nor do we believe there ought to be, a significant linkage between our efforts to promote access to

foreign markets and our policies to support and promote domestic research in key areas of high technology.

Turning to R&D specifically, the U.S. Government spends substantial amounts of R&D money on key technologies. For example, as I mentioned in my testimony, this Administration has proposed to spend approximately $15 billion for civilian applied research and development, a significant percentage of which would be allocated to developing advanced technologies, and nearly $5.6 billion on the defense side, not including SDI funding. In fact, the U.S. spends substantially more on R&D than Japan, Germany, France, and the United Kingdom combined. Our non-defense expenditures alone are almost twice as high as Japan's and about equal to the aggregate total of these four countries' R&D support. Although it is true that U.S. industry performs about three-quarters of all R&D in this country, the Federal Government provides 47 percent of the total R&D funding support. In addition to this direct support -- which I would not call a "subsidy" -- the Federal tax system includes a 20 percent credit for research and experimentation that the Bush Administration is seeking to make permanent.

Not only is the Administration supporting the extension of this R&E tax credit, but we also support the reduction of antitrust uncertainties concerning joint research and joint production ventures. We believe that, at this time, the best policy for the U.S. is to build on the considerable strengths of our own system, not import policies from other cultures that in many cases are not as successful as the media would have us believe. In fact, it is interesting to note that a fair number of foreign programs were formed in response to highly successful U.S. R&D programs -- for example, the Japanese integrated circuit programs and the European aerospace consortia.

QUESTION 6: **Do you disagree either with the technology "report cards" in the new Commerce Department report on emerging technologies or with the report's estimate that these emerging technologies could lead to $1 trillion worth of new products over the next 10 years?**

QUESTION 7: **Do you and the Administration agree that as a matter of national policy the United States should be at least equal to other countries in the 12 key technologies identified by the Commerce Department? If not, what are the Administration's goals regarding the U.S. position in these areas of technology? Furthermore, in your judgment, what specific actions, including Federal budget commitments, would be necessary to meet the goal of making the U.S. at least equal in these 12 technologies?**

ANSWER: The Department of Commerce report identified emerging technologies that its technical experts believe will be of substantial economic importance over the next ten years or so. The Commerce estimate for the 12 technologies taken together was about $350 billion of annual product sales in the United States by the year 2000. As a point of comparison, recent U.S. domestic shipments of electronics goods alone already exceed $200 billion annually.

OSTP agrees with the Commerce report that the 12 technologies designated as "emerging", are clearly of industrial significance at this time. However, we have not examined the details of the Commerce estimate of global market potential. Some of DOC's list of emerging technologies are likely to be included in one form or another among the critical technologies that will emerge from

the present study being performed under the auspices of OSTP. Predicting national competitive trends, e.g. in the area of biotechnology, is, however, a very difficult task. At the completion of the OSTP study, we believe we will have a more quantitative feel for exactly how difficult such projections are and will have developed our own assessment of the direction of the trends of those U.S. industries.

It is also important to note that the projections of future health and growth of U.S. industries are usually based on a continuation of current practice. A number of new studies indicate that with changes to these current practices -- some minor and some substantial -- there is every reason to believe that U.S. industry can, in any given area, become competitive again.

QUESTION 8: **Administration economists often say that they do not want to "pick winners and losers." Yet the Federal government has picked and supported winners since the early days of the Republic, first in manufacturing, then in agriculture and the railroads, and later in such areas as aviation and commercial nuclear energy. Moreover, the Administration continues to advocate programs in some of these areas; nuclear power is again an example. Could you please explain why the Administration has requested funds to help companies to develop new kinds of nuclear power reactors but has objected to working with industry to develop other kinds of technology, such as high-definition displays?**

ANSWER: In my testimony and throughout the answers to these questions, I have tried to indicate that this Administration believes that the Federal Government has played, and will continue to play, a large role in promoting and supporting R&D activities that are of both direct and indirect benefit to the private sector. It is clear, also, that the Federal Government currently supports a great deal of technology development and that previous Federal R&D investments have been very successful in developing technologies required for defense, space, and other civilian applications related to agriculture, energy generation, health, and aeronautics.

In cases where the Federal Government is the ultimate consumer for the R&D results -- such as defense and civilian space related R&D -- cost-effective and efficient decisions can be made on the basis of Government objectives, needs, and requirements. And, since most of this research is conducted by the private

sector, these activities are managed in such a way as to optimize the commercial potential of the R&D as well.

The Federal Government also supports a diversified fundamental research program to meet broader national needs in areas where the private sector cannot capture enough of the benefits for these activities to make R&D investments cost-effective. The support of agriculture and energy technologies to which you refer fall into this latter category. The Government supports, for example, fundamental research into nearly all the alternative energy generation systems including biomass, solar, wind, and nuclear power.

Federal support for nuclear power systems is also somewhat of an anomaly. Historically, the ideas concerning the possibility for nuclear energy generation were an outgrowth of military atomic programs. The fact that the material for fuel components can also have use in military applications dictated that the Federal Government retain the authority for possession and disposal of this material. Because of this, and the fact that historically the Government, itself, conducted the nuclear research, the Government is viewed as the most appropriate R&D institution for continuing to conduct nuclear systems research. The Federal

effort in this area of technology, however, is quite comparable to the Federal support for other alternate energy source power systems.

Past history testifies that the Federal Government has a poor track record in cases where -- although not the dominant consumer -- it has supported industry-specific or product-specific research. Thus, this Administration believes that the Federal Government should continue to participate with the private sector in precompetitive generic technology research programs. In the area of HDTV, for example, the Administration has proposed in its FY 1991 budget to Congress significant funding for the three key technologies required for future progress in industries including HDTV: $118 million for advanced imaging technologies, $469 million for high performance computing, and $537 million for semiconductor research. The results of this research will be available, on an on-going basis, to industry which can then use them to identify, develop, and produce commercial products and processes such as actual TVs or telecommunications machines. This Administration also has every intention of continuing to support R&D in these key technology areas because in many cases they are required for national security purposes, and in other cases they are needed for key projects in a number of civilian agencies.

QUESTION 9: **What is the Administration's policy now regarding the Defense Advanced Research Projects Agency (DARPA)? In particular, does the transfer of the agency's director signal a rejection of the Reagan Administration's policy of supporting "dual-use" research at DARPA -- research with both military and civilian implications? For example, will the Administration now propose to eliminate SEMATECH funding or to curb research in support of high-definition display technology? Also, why did the President request a cut of nearly $150 million in DARPA's $1.2 billion annual budget?**

ANSWER: The Administration's policy with regard to DARPA has not changed, nor do we intend to change it. DARPA continues to be the central high risk, high payoff research and development organization for the Department of Defense (DOD) with the primary responsibilities to help maintain U.S. technological superiority over, and to prevent unforeseen technological advances by its potential adversaries. DARPA will continue to pursue those highly imaginative and innovative research ideas and concepts offering significant military utility.

DARPA's investment strategy is guided by DOD's responsibility to maintain technological leadership in defense capabilities. Many of DARPA's R&D projects in advanced technologies have both military and civilian applications. Thus, the transfer of the agency's director clearly does not signal a rejection of the policy to support "dual-use" research.

The Administration continues to support funding for SEMATECH. DARPA has a comprehensive investment in information technologies (e.g., high performance computing, artificial intelligence and microelectronics packaging) and making information systems affordable. This includes the semiconductor manufacturing technology efforts being conducted by SEMATECH. Additionally, DARPA continues to invest significantly in technologies to collect, transmit, process and present information. Many technologies being supported by DARPA today and tomorrow support high definition display research and components of high definition systems.

DARPA's budget is representative of the trend in overall decreased Defense spending. The FY 1991 budget submission reflects the Department's priorities among R&D programs, while maximizing the effective use of its resources.

QUESTION 10: **As you may know, foreign companies are not allowed into the SEMATECH consortium. S.1191, legislation which I introduced and which the Senate passed last year, takes a less restrictive position regarding the participation of foreign-owned companies in NIST's new Advanced Technology Program (ATP): companies which meet certain minimal conditions, such as having research and manufacturing operations in the United States, may join ATP-assisted consortia. To my knowledge, the Administration has not objected to the SEMATECH rule, but surprisingly some in the Administration have objected to the Senate's less restrictive NIST language. These officials claim it is "discrimination" to focus taxpayer funds on Americans or to require foreigners to meet any conditions before being eligible to apply. Do you personally agree with this position? And does the Administration plan to give ATP funds and other Federal research awards even to foreign entities which have no operations in the United States?**

ANSWER: We all agree that one purpose of the Advanced Technology Program (ATP) is to enhance the international competitiveness of the U.S. economy. However, the specific conditions set forth in S.1191 go further than we believe is necessary.

Eligibility for ATP funding should not be based on whether companies are foreign-owned, but rather on whether the work they propose to do, and where they do it, will improve U.S. economic competitiveness. For example, the rules for the ATP program specify:

- o Consortium applicants should be allowed to include any company they wish (foreign or domestic), if that company is deemed essential to the success of the venture.

- All firms (regardless of national origin) should be allowed to participate in ATP-assisted projects unless they:
  - (1) are not incorporated in the U.S.; and
  - (2) do not have a substantial commitment to the U.S. economy.

In order for a proposal to achieve a high rating and be selected for funding through the ATP, the proposal should state clearly how the work will improve U.S. economic growth and the productivity of U.S. industry. In addition, Section 295.5 of the proposed ATP rule would enable the Secretary of Commerce to restrict or eliminate the right to obtain title to any subject invention resulting from an ATP project (1) when the funding recipient is not located in the U.S. or is subject to control by a foreign government, or (2) in order to promote commercialization of the invention by U.S. industry. We believe that these provisions provide adequate safeguards for technologies developed through the ATP.

QUESTION 11: **Please attach a list of all current committees and subcommittees of the Federal Coordinating Council for Science, Engineering, and Technology.**

ANSWER: **A tentative list of the Federal Coordinating Council for Science, Engineering and Technology's Committees and Subcommittees is (as of June 28, 1990):**

COMMITTEE ON EARTH AND ENVIRONMENTAL SCIENCES

Subcommittees:
- Atmospheric Research
- Ground Water
- Federal Oceanographic Fleet Coordinating Committee
- International Decade for Natural Disaster Reduction

Working Groups:
- Global Change
- Mitigation and Adaptation Technologies for Global Change

COMMITTEE ON LIFE SCIENCE AND HEALTH

Subcommittees:
- Biotechnology Coordinating Committee
- Committee on Interagency Radiation Research and Policy Coordination
- Decade of the Brain
- Protection of Human Subjects

Other Suggested:
- Neurological and Behavioral Science
- Risk Assessment Research
- International Research
- Computational Biology
- Plant Biology
- Social Sciences
- Ecology/Environmental Biology
- Support for Basic Biological Research
- Global Ecological Health

COMMITTEE ON FOOD, AGRICULTURAL AND FORESTRY RESEARCH

Subcommittee - To Be Determined (TBD)

COMMITTEE ON INTERNATIONAL SCIENCE, ENGINEERING AND TECHNOLOGY

Subcommittees:
- Title V Report
- International Science and Technology Cooperation
- Science and Technology Cooperation with Developing Countries
- International Cooperation in Big Science
- Technology and Competitiveness
- International Environment

COMMITTEE ON TECHNOLOGY AND INDUSTRY

Subcommittee: - Materials

Working Groups:
- High Temperature Superconductivity
- Structural Ceramics
- Versailles Advanced Materials Study
- Interagency Materials
- Nondestructive Inspection/Evaluation
- Automated Materials Processing
- Composites
- Electronic Materials

Others TBD: (Possibly Regulation, Technology Transfer, Intellectual Property Rights)

COMMITTEE ON EDUCATION AND HUMAN RESOURCES

Working Group: - FY 1992 EHR Crosscut

COMMITTEE ON PHYSICAL, MATHEMATICAL AND ENGINEERING SCIENCES

Working Group:
- High Performance Computing Initiative
- Access and Representation
- Structure/Support of Science

RESPONSES TO QUESTIONS POSED BY SENATOR JOHN McCAIN FOLLOWING THE MAY 23, 1990, HEARING ON THE COMPETITIVENESS CHALLENGE FACING U.S. INDUSTRY

Question 1:

In light of the changing international relations and defense environment, should we be reexamining DOD regulations governing technical information? Is there information and technology that has been withheld that could not be made public?

Answer to Question 1:

It is the policy of President Bush and the Department of Defense to encourage the presentation of scientific and technical information generated by or for the Department of Defense at technical meetings and in open journals consistent with U.S. law and the requirements of national security. Information is released in a manner consistent with statutory and regulatory requirements for protecting that information. Such requirements include, but are not limited to, protection of classified, unclassified export-controlled, proprietary, privacy, and foreign government information.

Over 98 percent of reports generated from research programs and about 85 percent of reports from all technology base programs supported by the Department of Defense are unclassified. Fifty-five percent of technology base reports are available to the general public. Even controlled information is available to appropriate audiences through conferences, symposia, and reports.

In response to the ongoing and dramatic political changes we are seeing, especially in Eastern Europe and the Soviet Union, President Bush recently announced the results of a major government-wide review of COCOM controls, which included cutting COCOM-controlled items by about one third. We are currently negotiating with our COCOM allies to establish a core list of controlled technologies, further streamlining export controls. As these changes are made, the technical information associated with previously controlled technologies will also become more widely available.

Of course, information that must be classified because of its bearing on national security will continue to be protected, as will proprietary information, foreign government information, and information that bears on individual privacy.

Question 2:

It is very easy for the Japanese to come here and learn our technology and science. They then go home and commercialize that information. Are there any federally funded programs to send our scientists to Tokyo to work in private labs?

Answer to Question 2:

The National Science Foundation provides grants for study by U.S. scientists at domestic and foreign laboratories. These grants are made available at institutions of the visiting scientists' choice upon approval of the grant evaluation process. Since May 1968, 100 grants have been approved for study in Japan, and two or three of those were in private laboratories. This reflects more the choice of the grantee than the access to the facilities in Japan. In addition to language and cultural difficulties, career concerns are a major impediment to research and study assignments in Japan. The presumption, and indeed in many cases the practice, is that industrial researchers and academicians do not advance their careers by pursuing research opportunities overseas. Nonetheless, the Technology Administration in the U.S. Department of Commerce is currently developing information to assist U.S. companies to place researchers in foreign laboratories, particularly in Japan and the European Community.

In addition to the NSF program, the National Institutes of Health sponsor post-doctoral fellowships in the biomedical field that can also support study at any institution worldwide subject to peer review of the study proposal.

The Omnibus Trade and Competitiveness Act of 1988 calls for "access to research and development opportunities and facilities." In addition, the U.S.-Japan Science and Technology Agreement calls for "comparable access to major government-sponsored and -supported programs and facilities." While this legislation and agreement do not fund U.S. researchers, they do attempt to uncover and eliminate any barriers to access by U.S. researchers to Japanese research facilities.

Question 3:

Does the government currently assist in providing Japanese language translation services to translate Japanese scientific papers into English for the use of our scientists and engineers? If there are such services, how can we best ensure that they are fully utilized? If there are not such services in existence, should we provide them? Or provide Japanese language courses to enable scientists to have greater access to valuable information?

Answer to Question 3:

Within the Department of Commerce, the Technology Administration and the National Technical Information Service monitor Japanese technology and collect Japanese information for public dissemination. This activity is governed by the Japanese Technical Literature Act of 1976 (P.L. 99-382). Japanese research and development activities are reported to the U.S. public through various announcement media, and a small number of reports are translated at Government expense each year. The Japanese Technical Literature Program is funded at approximately $500,000 per year.

The National Science Foundation recently has acquired online access to NACSIS (National Center for Science Information System), a Japanese Ministry of Education database of science and technology literature in Japan. The service is freely available, and NSF will provide translation of titles and abstracts on request from users.

The Department of Energy's Office of Scientific and Technical Information (OSTI) receives a large body of information from Japan on energy-related technologies, including advanced materials. The DOE is a party to multilateral information exchange agreements through the International Atomic Energy Agency (IAEA) and the International Energy Agency (IEA). DOE's OSTI is the operating agent for the IEA agreement. Through these agreements, DOE receives approximately 10,000 abstracts per year -- in English -- of Japanese research. Those abstracts are made available both within DOE and through commercial database services. OSTI also receives the full text of those research reports and will arrange for translation upon request from a relevant DOE program. The National Technical Information Service (NTIS) in the Department of Commerce can also arrange for translations, at cost, of reports from the same databases for private organizations.

With regard to language training, NSF funds Japanese language training for approximately 50 science and engineering graduate students each year. Students are funded for up to two years under the program. In addition, under the U.S.-Japan Science and Technology Agreement, NSF began a summer internship program in Japan for 25 graduate science and engineering students. The program is jointly funded by NSF and the Science and Technology Agency in Japan. The first group of students left for Japan on June 9 and will spend seven weeks studying Japanese language and culture and working in Japanese government laboratories. It is our hope that they will develop language skills and make professional contacts that they can foster well into their professional careers.

Question 4:

In February of this year, the President announced his intention to appoint members to the National Critical Materials Council. In addition to you as Chairman, the members include T. Ary, Director of the Bureau of Mines and W. Henson Moore,

Deputy Secretary of Energy. What role do you foresee the Council playing in the Bush Administration?

Answer to Question 4:

The National Critical Materials Council will play a role in the coordination of materials policy. The Council will focus its coordinating activities in three general areas of materials policy: 1) The conventional critical materials, which include such metals as chromium, platinum, manganese, and cobalt that are geologically concentrated on the earth's surface and for which we are highly dependent on imports; 2) Advanced materials, which include new and enabling materials that tend to be low-volume, high-value-added niche materials. These materials include high-temperature structural ceramics, intermetallic alloys and other specialty metals, high-performance plastics, and combinations or composites of these three materials types; 3) Superconducting materials, which are the class of advanced materials that lose all resistance to electricity when cooled to very low temperatures. A new class of these materials, the ceramic superconductors discovered in 1986, offers superconductivity at relatively higher temperatures (achievable with liquid nitrogen coolants). The Council will provide coordination among the agencies for other materials issues as they may arise.

Question 5:

What is the status of the Competitiveness Council? Will new members be appointed to the Council in the future?

Answer to Question 5:

The Council on Competitiveness has been involved in Administration activities relating to product liability, biotechnology, training and education, and the cost of capital. In addition, the President recently designated the Council as the appropriate council to review issues raised in conjunction with the regulatory program under Executive Order 12498 (Federal Regulation). The President has also directed the Council on Competitiveness to exercise the same authority over regulatory issues as did the Presidential Task Force on Regulatory Relief under Executive Order 12291 (Regulatory Planning Process), which established the Administration's regulatory review process.

No new appointees to the Council are anticipated at this time. Various Administration officials are brought in to assist the Council on special issues as necessary.

Question 6:

The incorporation of composites and other advanced materials into automobiles and industrial processing systems have the potential to generate significant energy savings and the concomitant environmental improvements that result from reduced energy use. What federally funded programs exist or are planned to facilitate the realization of these goals through the use of advanced materials?

Answer to Question 6:

Many agencies are working within the context of their individual missions to foster technologies that will enhance energy efficiency. For example, in the area of industrial processes, the Department of Energy's (DOE) Office of Industrial Programs, Improved Energy Productivity Division, conducts research and creates new energy-conserving processes for ore reduction, metals production, and basic shape processing. The Bureau of Mines of the Department of the Interior funds similar work.

As regards transportation systems such as automobiles, there are two basic areas that can incorporate composites. The engines can use ceramic and metal matrix composites, and the body panels can utilize polymer composites. In the area of ceramics, the DOE's Office of Transportation Systems continues to pursue research in advanced ceramics, ceramic composites, and ceramic coatings that will provide components for high-efficiency propulsion systems while decreasing requirements for strategic metals and materials. Much of this work is carried out in cooperation with NASA's Lewis Research Center. In total, about $80 million per year of structural ceramics research is conducted by the Government, and most of this could have application to automotive engines or other transportation systems. The DOE also conducts very basic research in polymeric composites -- for example, examining how the boundaries between two different types of materials interact over time. The National Institute of Standards and Technology (NIST) is doing work on polymer composites that is directed towards automotive applications. The principal goal of the NIST work is to develop processing methods that are rapid and inexpensive. The budget for this effort is about $1.5 million. Also, the National Science Foundation funds work at the University of Delaware in polymer research as part of its Centers of Excellence Program, as well as at other universities such as MIT and Rutgers. In addition, the three U.S. automobile manufacturers have been engaged in a consortium for the development of polymer composites for two years. Negotiations are currently in the final stages for a collaborative effort between NIST and the consortium. This consortium is the result of legislation that has made it easier for companies to conduct joint ventures without fear of antitrust action.

In a number of ongoing Department of Defense (DOD) programs, present and future weapons systems are examined to identify performance or economic issues that are limited by the capabilities of existing materials. The use of lightweight carbon-epoxy composite materials in civilian as well as military aircraft is an outgrowth of such an examination by the Air Force. Many of the advanced materials applications required by DOD are of such novelty that concomitant advances in manufacturing techniques are mandated. Those manufacturing advances frequently are usable in the production of quality, cost-competitive commercial products. The DOD conducts much of its research in polymer composites at Wright Patterson Air Force Base.

Dr. BROMLEY. If I may, then, sir, I would turn to your questions.

The CHAIRMAN. Yes, sir. Proceed, please.

Dr. BROMLEY. Should I, Mr. Chairman, read those questions for the record?

The CHAIRMAN. You can brief them because they are a little wordy. I will admit that.

What I was trying to do is make sure you came to the point that we had in point, the concern that we had in mind.

Dr. BROMLEY. I understand, Mr. Chairman.

The first question is, what are the administration's specific objectives regarding technology and industrial competitiveness, and what is the administration's strategy for meeting those objectives? The question goes on, but that is the main point.

I would answer that, sir, with the following points.

First, the administration believes that investing in new technologies is a necessary but not sufficient condition for achieving international industrial competitiveness. Other factors—economic, educational, fiscal, regulatory and cultural—also influence the position of U.S. firms in the world market.

DOD has recently issued its report on critical technologies. This list is being integrated into DOD's investment strategy for research and technology, and my office, at the request of the Congress, is in the process of developing a list of critical technologies that would incorporate both the Defense and the Commerce lists. We are working with the private sector and with those agencies and will be reporting to you in the Congress on the results.

In the course of developing our list of critical technologies, current Federal and industrial funding levels and priorities will be examined and, where appropriate, agencies may be asked to revise their funding plans or to arrange for R&D collaborations across agencies and across sectors, Federal, academic and industrial.

What makes the technology critical is its potential applications. In our view, the most important point is that U.S. firms have access to these critical technologies. Assuring this access may require, in some cases, U.S. R&D funding to maintain or establish U.S. scientific and technical leadership. In other cases, irrespective of whether the source of the knowledge base is foreign or domestic, the issue is really whether the U.S. firms will use and/or adapt to their use these critical technologies.

You have also asked what percentage of the Federal R&D budget will the administration propose to spend over the next three years on research in support of industrial development? Will it remain near the 1987 level of only .2 percent, or will it increase?

I would have to begin an answer to that question, Mr. Chairman, by emphasizing that that figure of .2 percent I believe comes from an OECD document, and it is very dependent on the definitions that are used.

To suggest that we are spending only .2 percent of Federal R&D on industrial development misrepresents the activities rather badly and has more to do with country reporting to the OECD than it does to the actual activity. These OECD figures fail to reveal that R&D that is categorized under other areas—including health, energy, agriculture, defense, civil space and advancement of knowl-

edge—also leads to industrial development in the form of new products and processes that have nongovernmental applications.

In addition, industry performs much of the R&D reported in these other categories. The U.S. Government has a longstanding philosophy of not supporting product development except in very limited areas where the government is the primary customer. The philosophy is based on the view that the government should be active only in those areas where the private sector has inadequate incentives for investments that contribute to the national welfare.

Based on this view of market failures, the government plays a role in such areas as defense, health, energy and environment and supports R&D in these areas to meet its missions more effectively. The administration expects that the U.S. Government funding of R&D for industrial development reported to OECD will remain a small share of the total Federal R&D budget; however, we believe that significantly more than 10 percent of the Federal R&D budget contributes directly to economic growth and that a significantly large contribution will continue.

As I indicated in my prepared statement, Mr. Chairman, a quick look at the proposed Bush Administration budget for 1991 shows that well over $5 billion is requested to support high technology development.

U.S. industry also benefits from the result of basic research done in academic and Federal labs to advance knowledge as industry turns these results into commercial processes and profits. So in this particular case we have a question that occurs again and again, that of definitional intercomparison between countries.

You asked then, sir, exactly what kinds of research projects will the administration support in order to carry out the President's pledge to work with industry in the critical precompetitive development stage where basic discoveries are converted into generic technologies?

Let me mention, too, that the Department of Commerce's Advanced Technology Program is a good illustration, in my view, of how this administration will carry out the President's pledge to work with industry on precompetitive research on generic technologies. The Advanced Technology Program will be supporting joint ventures and other research projects suggested by industry. NIST will rely on industry to develop viable cooperative research arrangements relating to technologies that will benefit broad sectors of the economy.

I emphasize, sir, that the NIST program in the Department of Commerce is characterized by cost sharing and, therefore, is leveraging support from outside the Federal sector.

This program is funded at $10 million in the 1991 budget. I look on this as a pilot program, and if it is as successful as I and my colleagues in the administration have every reason to believe it will be, I would look to substantial expansion of that program and of NIST's role.

The second point that I would take up is the fact that the 1991 budget continues support for research by the industry consortium, SEMATECH, and for research in high definition display technologies. I am quite confident that that support will continue and, to the extent that the budget allows, may increase.

These are the kinds of programs I support: programs that involve shared expenses by the Federal Government in the private sector, programs that involve consortia coming together to share risk expense and to accelerate the development of generic technologies. Both of these I view as very important roles for the Federal Government and ones that I will do everything I can to support.

The Administration does not plan to curtail DARPA research on dual-use technologies. The Administration recognizes the importance of maximizing the return on Federal R&D spending, and dual-use technologies permit taxpayers to benefit both from the defense application and the application to civilian products.

The Administration would be concerned, however, about the appropriateness of DARPA's spending on a technology that had only very limited military application or that was not as cost-effective as other approaches for meeting the military's mission.

NIST's primary role, on the other hand, is in the standards and measurements area. In this area, NIST, DOE and other federal agencies have had very useful, successful, cooperative R&D relationships. For example, the NIST work on common architecture, done initially with major funding from the Navy, has been used in NASA's telerobotic flight servicer.

In general, I believe that NIST brings to the program a very important parameter. NIST, over the years—back in the Bureau of Standards days and since—developed working relationships with a very broad range of industry. It is, I think, up to us to learn how to use those relationships much more effectively in getting technology into the hands of the ultimate industrial user.

NIST is also playing a very important role in several new programs designed to improve the competitiveness of American manufacturers—I have mentioned already the Advanced Technology Program, the Manufacturing Technology Centers. Both of those programs are new and, as I mentioned, are still in something of a pilot process stage. The response of industry to these programs and their effectiveness will be examined closely as we move forward to possible expansion of both of those programs.

You then, Mr. Chairman, asked what is the Administration's overall response to foreign targeting of key technologies and industries. I would have to say that it is not true, despite repeated statements to the contrary, that American companies are losing market share across the board. A good example is in the chemical industry, where the U.S. positive balance of trade continues to rise, to $16 billion in 1988, the U.S. is not in fact losing technological leadership across a broad spectrum of activities.

We are not doing as well as we should, however, in translating technological leadership into positive trade balances. The U.S. Government already spends substantial amounts of research and development money on key technologies. As I noted, the Administration has proposed $15 billion for civilian applied research and development in fiscal year 1991. Even if the product-specific applications need customized work, technologies are often built on a common knowledge base to which R&D in the mission agencies contributes directly.

There also dual-use technologies that have come out of the R&D and procurement activities of federal agencies—for example, DOD's

important work in the computer area and with respect to semiconductors. Some foreign programs are formed in response to successful U.S. R&D programs—for example, the Japanese program in integrated circuits and the European aerospace consortia.

The Administration seeks to obtain U.S. access to foreign R&D programs on all key technologies. The U.S. goal is to obtain national treatment so that there is no discrimination against U.S. firms, but all firms must meet the same criteria for participation.

In the Uruguay Round of multilateral trade negotiations, the U.S. is seeking to reform and revise the international subsidy practices of all GATT participants. A successful conclusion for this session would make for a substantially more level playing field.

And last, the final question in your invitation letter, Mr. Chairman, said, does the Administration have a comprehensive proposal for reducing the real cost of capital in the United States?

The cost of capital, without doubt, is an important factor in investment decisions that all firms must make. The Administration recognizes that the U.S. investment rate, while reasonably healthy, is lower than the rate in other countries as a result of policies that are biased against investment. The Administration is committed to removing impediments to investment.

There is considerable evidence to show that cost of capital, or perhaps real interest rates, may not be very different between the U.S. and Japan if we take into account the tax structure, arbitrage and so on. The biggest problem in the U.S. is that the capital here is not patient. That is, the financial analysts demand short-term paybacks. You yourself commented on this earlier this morning, sir.

This works inherently against the long-term investment such as research and development that are required in our industrial sector. For this reason the Administration has proposed a permanent cut in the capital gains tax. Of all the industrialized countries only Australia and the United Kingdom have higher capital gains tax rates, and theirs may be lower in real terms since they are indexed for inflation, unlike ours.

An important point to remember is that the evidence suggests that a key group that has taken advantage of capital gains tax cuts are the high technology entrepreneurs.

Another important Administration proposal that would lower the cost of capital is a reduction in the double taxation of corporation equity earnings. It is evident that the high capital gains tax and the double taxation of equity earnings increases the cost of capital. These are two policies that are crucial to improving the rate of investment:

With respect to high technology R&D-intensive industries, one of the most important ways to reduce the cost of capital is to make the research and experimentation tax credit permanent. This would help firms take a longer-run perspective toward R&D without being concerned that the tax laws would shift against them.

The Administration recognizes that when macroeconomic policies change frequently a risk factor gets built into the cost of capital, increasing its cost. Therefore, in addition to the permanent R&E tax credit, the Administration is committed to pursuing policies which reduce this risk factor, and therefore the cost of capital, by

keeping inflation low and creating a stable investment environment.

And a final point—another important way to influence the cost of capital is to increase national savings. The single most important means to achieve this end, to which the Administration is fully committed is to reduce the federal budget deficit.

In addition, the Administration has proposed creating family saving accounts, annual savings that would be non-deductible, but which would not be subject to income tax; a plan that would supplement existing IRAs and KEOGHs.

With that, Mr. Chairman, I would conclude my immediate testimony.

The CHAIRMAN. Very good, sir. We appreciate it.

Now let us hear from Mr. Resor.

STATEMENT OF GRIFFITH L. RESOR III, PRESIDENT, MRS TECHNOLOGY, INC.

Mr. RESOR. Good morning, Senators. And thank you for the opportunity to speak.

I am Griff Resor; I am the President and founder of MRS Technology, a Massachusetts-based venture capital funded start-up company founded in 1986. We serve the flat display business—or in the Commerce Department words, the digital display business. We make $2 million photographic technology-based manufacturing tools for the world market.

I have been in that business five years. Before that I was in the IC manufacturing equipment business for 20 years. I have lived in the middle of the international high-tech playing field for 25 years, and watched it go from a piece of cake to an aggressive battle.

I appreciate the opportunity to be here this morning and try and share with you some of my views of what is really going on.

Since our subject this morning is both U.S. technology policy and economic competitiveness, I would like to start with just a few remarks on the Administration's technology policy. And, Allan, it is very good to be here and hear you speak. I think technology policy must be classified. It is one of the best kept secrets in Washington, and I have been taking copious notes.

As a business manager I learned to listen carefully, but look for the actions that speak for the true likely result. I think those of you who have been managers know the hardest job is to figure out what is reality. The reality of the Bush Administration policy in technology appears to be to shoot the messenger.

The Defense Department report on foreign dependency, the National Advisory Committee on Semiconductors, the Defense Manufacturing Board—I could go on—Project Socrates, have all been shot as they put forth their controversial results.

Senator GORE. Craig Fields.

Mr. RESOR. I will get to that. Thank you.

The firing of Craig Fields, in my opinion, is a national disaster. I have met many people who claim to be leaders in business. Craig was one of the few people who demonstrated that capability consistently, day in and day out. He worked probably 100 hours a week. He was accessible to all of us. And he had a vision. He was

also technically competent and experienced. He was exactly the kind of civil servant I am happy to see tax dollars support.

I do not understand how an administrator could demote and demotivate an entire organization by tackling such a person. Clearly we are studying Japanese. The Japanese policy is the nail that sticks up gets pounded down. And that is what happened to Craig, and the message is understood across the federal executive bureaucracy. I am sure that is not how Allan handled bright people at Yale.

Enough on Craig.

You also asked me to comment on four questions, and I will go through those now.

The first question I think is the key: What is the nature of economic competition in the world market? And I think the problem is that in this country we really still have two views of that reality. And our actions will never get down to a consistent set of policies and results until we come to one view on reality.

The first view is that laissez-faire free markets exist in all major economies. Any distortion of that is temporary and can be changed through the mechanism of diplomatic negotiation. I was in Japan at the time of the SII talks, and I predict they will prove to be only talk.

The second view is that in most world economies outside of the U.S., and perhaps Britain and Australia, competition now involves a tough battle sponsored by government and industry teams, and that this is not about to change.

Clyde Prestowitz is probably the clearest spokesperson for this second view. I also ascribe to the second view, as a result of my experience. In fact I have watched it switch from the first to the second reality.

The new reality is that economic competition is among nations guiding their industry, not among companies assisted or regulated by government. The electronics industry is a good example. It also is the industry that I have been in. Electronics is not an industry in decline, it is a major growth industry. It is now three times bigger than automobiles and nine times larger than steel.

That is its problem.

Electronics is seen as the key to economic well-being and a good standard of living for industrialized nations in the 21st century. Some call it the information age. Foreign nations have particularly targeted electronics. They want a piece of that pie and they are not about to lose a piece of that pie.

Individual companies, in my view, are no match for trillion-dollar economies if those economies set about to accomplish a particular industrial goal. Even IBM at a $50 billion volume will not survive the organized attack of Japan.

There is another problem that "BusinessWeek" has just highlighted. Corporations are no longer nationally based. BusinessWeek has called them stateless corporations. My small company of 50 people has to compete in Japan, Europe and the United States. We have set out from the beginning to be a micro-multinational, if you will. One of my founding partners is a Japanese national.

So policies based on laissez-faire free market notions of markets and U.S.-based industry notions of industry I believe are doomed to

failure. Because the view of the market reality and the view of the industrial reality are both wrong. Competition is not laissez-faire, and industries do not have national priorities as their main goals.

Your second question had to do with the present level of federal effort. I do not mean to be unkind, but I view the present effort as defocused and tokenism. I think within branches of the government there is a good recognition of the new reality. Within Defense, Commerce, many members of Congress, and other people who are in touch with the day-to-day competition, there is a great sense of urgency and a good sense of the problem.

People who seem to have contemplative staff positions in the White House, CEA and OMB continue to view the world as it used to be.

If you will allow me a diversion, I am reminded of a story that is common in the Boston area. As you know, every April we celebrate the beginning of the revolution in Concord and Lexington. And I am told that when the British officers got back to Boston they were very upset with the way warfare was conducted. The colonialists hid behind trees and shot at the British Indian-style. And the British complained bitterly that the form of warfare was not fair; if they could only get the colonialists on an open field—today we say level playing field—they could have won the battle.

But the nature of warfare changed as a result of the Indian-style of fighting, and it changed forever. And I think that there is a good analogy in economic competition today. We need to recognize that the basis of competition has fundamentally changed and get on with the business. We cannot try and change the rules back to the old way. It did not work for the British, and it is not going to work for the United States today.

You asked me if the uncertainty of government support held back business. And I actually made a rather snide comment in my written commentary. I do not think there is much uncertainty in the business community about government support. The prevailing view is there is no government support when it comes to trade conflict. The State Department wins out every time.

This definitely hurts in targeted industries. If you have no competition, for example, a local ice cream franchise—Japan has not targeted that segment to my knowledge—there is no problem. You do not need the government support. But if you are in a targeted segment, like electronics, it definitely scares away investment to have the government not involved in the national interest.

And finally you asked what should we do about this.

And I have worked up really two plans. Plan A is an aggressive plan: I would recommend that we recognize the new reality for economic competition. Nation-based targeted economic competition is here to stay. It has simply been too successful to go away. We must respond in kind. Government and industry need to team. We need to emphasize free market mechanisms wherever possible.

I do not see this as a binary choice. We need to stop being afraid to target on our interests. In order to target it means we have to define our goals.

One of the problems I have with the Bush Administration is that it is not clear what the goals are.

We have to have a plan. That is a complex process.

We need to improve our yardsticks for knowing how well we are doing. I am amazed that we do not even keep track of foreign investment in American companies. There are all kinds of questions about the trade statistics. Certainly that whole feedback mechanism needs to be examined to make sure it is an accurate measure of our success or failure.

It seems unlikely that Plan A will be carried out in the Bush Administration, so I have Plan B. Plan B would be to do what we can agree upon and to keep talking. We need to be sure our telecommunications and computer industries remain healthy. They are the last significant end-user market segment we have in electronics.

We need to support DARPA and NIST's ATP programs. R&D reduces risk in the cost of capital, as Allan has said.

We need to change the antitrust laws to allow manufacturing consortia. We need to make sure that the fair pricing rules we set for ourselves 100 years ago are applied to all competitors in our marketplace, foreign or domestic.

We need to reduce investment cost. Allan gave us a very good list. My list is almost the same. Clearly the Bush Administration understands money.

And I would say we need to strengthen K through 12 education. My view is that we need to assure a pipeline of dedicated people who produce quality products. I think the university institutions are in pretty good shape.

We need to focus on ways of bringing innovation from the idea centers to the market. That is clearly our national weakness. Most of the innovations that I am involved in, in digital displays, were invented in U.S. industrial labs, RCA, Westinghouse, Corning, and have been commercialized by Japan.

In fact I believe most of the key technologies were developed in digital displays with the benefit of federal R&D money.

Plan B can be done now. It will take longer I believe to get to Plan A. Hearings like this help.

That concludes my verbal testimony. Thank you.

[The statement and questions and answers follow:]

STATEMENT OF GRIFFITH L. RESOR, III, PRESIDENT, MRS TECHNOLOGY, INC.

Mr. Chairman, my name is Griffith Resor and I am President of MRS Technology, Inc. which is located in Chelmsford, MA. MRS was founded in 1986 to develop the key technology to do high resolution photolithoghraphy for active matrix LCD flat panel display manufacturing. As a manufacturing concern, which is by the nature of its technology placed squarely in the middle of the "playing field" of international business, we feel that we are well-suited to give testimony on the subject of today's hearing and we appreciate your invitation to do so.

The genius of the Marshall Plan was its vision that economic competition could replace warfare, that market driven prosperity could win out over communism, if given the time to prove itself. This has worked beyond anyone's recent expectations. Economic competition among nations is now the new "battle ground" of nations. This is good news, provided that the U.S. responds to this new world.

Dr. Lewis Branscomb of the Harvard University's John F. Kennedy School of Government said recently, "The concern about the competitiveness of the U.S. economy in international trade is, in part, a reflection of concerns about shortcomings in the national technological enterprise." He went on to say "shortcomings in the technological enterprise concern areas of science and engineering outside the research and development corridor-indeed lie primarily there. The impact of technology on science is now as large as the transformation

science has wrought in technology."

FOREIGN COMPETITION

The methods used for competition by our trading partners have not been those used in the United States. Our laissez-faire market economy is not what has been adopted by these nations. A much more tightly coordinated "teaming" of governments with "strategic" industries has been the norm. National "visions of the future," direct R&D funding, focused tax and investment incentives, international credits, and a host of other tightly coordinated government/industry actions have earned the rebuilt nations their position of success today. Clearly "free" markets have had a key role to play; but they have not been the only force at work. Government has also played a leading role, with great success, especially in Japan. These changes leave the U.S. with two serious structural problems.

First, many U.S. companies have become multinationals, with no real national loyalty or focus to their worldwide organizations. The link between company goals and national goals is broken. It is folly to expect U.S. free market forces and multinational self-interest to optimize our national agenda by themselves. The debate is not "free markets" or government as binary choices; the view needs to be government plus free markets achieving the desired national result. We already have many examples of this. Zoning is an accepted

method of controlling market forces within a community to achieve land use goals; environmental standards are now accepted as the way to achieve environmental goals within "free markets." These are only two examples of how government must be involved in determining the outcome of competitive market forces. As our competitors have shown, teaming of government with industry is what's needed. In this effort it will be best to view our national role as competing for the attention of multinationals, not just regulating their behavior.

Second, the many small companies who remain essentially United States based, such as MRS Technology, find competing in this new world very challenging. In many cases, we are asked to compete without any U.S. government support. However, our competition has the full support of their governments. If a nation targets our market, it is simply no contest. Nations can bring billions of dollars to their effort. Only the largest U.S. corporations can muster this type of effort. Even IBM cannot beat the entire nation of Japan, if Japan decides to target computers (which is just what Japan has decided).

Perhaps it will help the Committee to understand the power a nation can bring to high tech competition if I explain briefly the Japan HyVision program. Underway now in Japan is a set of coordinated national programs to link the nation with high bandwidth fibre optics, to support this with fast switching telecommunications gear, and to create all the high

resolution "picture" generating gear needed to capture store, display and edit color pictures. Just as we FAX black and white images around the world today, we will soon be sending color, high-resolution images around the world. Every business will need this hardware to compete. In Japan they are not waiting for market forces to coordinate the development of all this gear. Instead, they have organized a national program to invent and install all this hardware in HyVision model cities. Within five years all the hardware needed to do this job should exist, be consumer tested, and be ready for an export market assault.

In the U.S. we will install such networks where they make economic sense today (major trunk lines), we will let individual companies develop products, and eventually, over 15 to 20 years, our market mechanisms will create the desired result. However, Japan's approach will accelerate progress significantly giving their industry the dominant position in world markets ahead of our individual company approach.

To illustrate what I expect, HDTV cameras capture images for industry (and home entertainment). The information will be stored on studio quality tape. HDTV monitors will be used to view the result. Soon these monitors will be replaced by flat displays (AM/LCD) with the resolution of laser printers, in full color. 100" diagonal full color projectors using AM/LCD technology are available today. Hard copy color output can already by done with advanced color copiers/printers, or professional printing systems. Live video will continue

to be transmitted by satellite links (DBS). Small DBS antenna and receivers are now available from every major supplier, to facilitate local reception and use of the information. Transmission to other sites can be done by color FAX. ISDN networks will speed this process. Every image used in industry to support conferencing, selling, design, and service can be captured, stored, edited, distributed and published electronically in real time. A revolution in business practices must be the next step.

For example, high resolution color, flat computer graphics systems, on desktops, will enable many decentralized users to manipulate these images, as is done today by a few skilled people concentrated in graphics design and printing houses. The revolution in "desk top graphics" which has already been launched, will continue. The shift will be to more local processing of full color images. Uses will proliferate as the ease of doing the image work yourself improves. Hand carrying images on tape to centralized process centers will be replaced with many participants doing distributed work on these electronic image networks.

This competitive problem is particularly acute in high growth industries now seen as the key to a high standard of living in the next century. These are the segments most sought by other nations for their citizens. The electronics industry is one such industry; biotechnology is another.

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Our complaints that this new method of competing is not fair remind me of the complaints the British soldiers made upon returning from Lexington and Concord. The colonials fought from tree to tree, like Indians. The British wanted them to line up in fields and fight like men. I can hear the British officer now, "If only we could get them to fight on an open field!" The world ultimately changed. We face this challenge now, in economic competition, and must change too.

PRESENT FEDERAL EFFORT

Government entities that must operate in the real world, the Departments of Defense and Commerce, and the Congress, appear to understand the fundamental change taking place, and are now eager to change our style of competing to join government with industry and compete. Those departments engaged in internal thinking and control, such as OMB, CEA, and the White House staff, do not appear to grasp the fundamental changes that have taken place in competitive world markets. They are like my British officers of 1776, still trying to get the rules of play restored to an older view. As a result of this conflict our nation's efforts remain mired in "tokenism." Improving the R&D tax credit will help a little; reducing the cost of capital will enable more U.S. based investment in longer range projects, enforcing dumping more vigorously will encourage infant industries, enabling manufacturing consortia will help too. These efforts should be encouraged. However, it is a mistake to

believe that they alone will prove sufficient to the task. Our competitors are much more aggressive; most of these efforts will support all players equally. In fact that is their announced goal.

By no means do I have a clear road map to present. This can only be worked out over time, and will constantly change. What worked in other nations will not work exactly in ours. We must find our own way. I am firmly convinced, however, that every journey begins with a single step. For the U.S. that step must be to recognize the new methods for economic competition, and to engage in competition by the new rules. We need to join government and industry together in this competition; we need a mechanism for articulating national economic goals and then translating them into government policies that encourage and regulate multinationals to support our national goals. The Commerce Department appears to me to be the logical choice to build this capability and mission.

UNCERTAINTY OF GOVERNMENT SUPPORT

I find no uncertainly about the supporting role of the U.S. government on trade issues. The prevailing view among businessmen is that the government is never supportive. Businesses have retreated from consumer electronics as they became certain that the U.S. government would not assist them with their problems. The final blow in the TV dumping cases came

when our own Justice Department argued, successfully, the case for the Japanese against the U.S.-based TV companies. As I understand this case, the prevailing view was that the U.S. anti-trust laws could not prevent collusion by foreign governments. We do not have jurisdiction in their nations. This is a reasonable view but leaves the basic problem unsolved and unsupported.

RECOMMENDED ACTIONS

My primary recommendation, that the government and business team and engage in the new competition according to the new rules, seems unlikely to succeed in this administration. More time appears to be needed before national consensus in achieved. In the meantime, half a loaf is better than none. In fact, this is how we muddle though to our own solution.

The U.S.-based electronics industry must first defend its computer industry and telecommunications industries. These are the only large scale electronics industries remaining. The IC industry is large, but plays a supporting role; the U.S.-based semiconductor equipment and materials industry (SEMI) is large, but also plays a supporting role. Support for these industries is necessary but will not be sufficient. Without U.S. manufacturers serving end use markets, these supporting industries will continue to decline. These industries have been critical to defense, so DARPA and DOD have played strong

supporting roles in the past. It is not clear how this will change in the next few years. DARPA 's budget for semiconductor initiatives should be supported next year.

Flat panel displays, the sector that MRS Technology supports as an equipment supplier, will play a critical role in the future of computer markets. Suppliers who first deliver flat high resolution color screens for their lap tops and workstations will have a significant advantage in the computer marketplace. The infant industry in the U.S. needs R&D support to perfect its skills and move to market. Japan and Europe have already launched their assaults on this key technology. Flat displays will find commercial markets much larger than DOD markets; however, DOD has many serious needs too. The administrative focus for such dual use technologies is not clear. DARPA has organized its program, but lacks adequate funding. NIST's ATP may provide a better long run location for the flat display programs. This remains to be proven. I support the significant increase in the ATP funding authorization in the FY91 budget recommended by the House Science and Technology Committee in HR 4329.

I think that the most significant tax incentive for high technology industries would be to reinstitute a significant investment tax credit for new factories and equipment. This is the largest investment new entrants face. The R&D tax credits, as currently set up, provide too small an incentive and need to be made a permanent part of the tax code.

The cost of capital plays a decisive role in U.S.-based investors' attitudes towards new investment. Basically the high cost of capital is causing U.S. investors to heavily discount future earnings in long term businesses. This discounting makes such business appear unattractive to U.S. trained decision makers. Our competitors do not shrink from such investments, mainly because they are using different investment decision rules and analysis, which are less dependent on the cost of capital. Reducing the cost of capital should help restore a longer range view to U.S. based investors.

Another major problem in the flat display business, or any other consumer-oriented product, is the fear of dumping. If a business cannot see a prospect of profits, it will not invest. The U.S. practice of granting the consumer the best short-term benefit, regardless of the impact on U.S. industry, and the TV industry's experience make industry's concern legitimate. I believe we need to amend the anti-trust and fair pricing laws to make it clear that they apply to all sellers in our markets. I believe we need to be proactive in enforcing these and other dumping laws, so that skilled competitors have a chance to make profit in this market. Industry is not looking for a protected, risk-free marketplace. This would not be healthy. But a chance to compete fairly is drastically needed.

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7 June 1990

Senator Larry Pressler
Committee on Commerce, Science & Transportation
Washington, D.C. 20510-6125

Dear sir:

You have asked one of the most difficult questions in the whole "industrial policy" debate. **"What is an American company, anyway?"** This question has occupied a great deal discussion already, so some well thought out ideas now exist. I first participated in a discussion of the question in 1988 as a member of the AEA HDTV task force. Again, as a member of the Defense Manufacturing Board (now Defense Science Board), I had the opportunity to discuss this question at length. The main points of view are summarized below.

What is an "American" company?

Ownership: The discussion usually begins from a stock ownership point of view. The argument states, "If Americans own the shares, it must be an American company." But, as you ask, if a company is mainly owned by USA funds and individuals, but does all its work overseas, is this helping the USA? Doubtful.

It is not even clear who really provides the dollars in many USA based funds. Japanese and European (and I suspect Saudi) interests are everywhere. So how do you even know the owners are American? And finally, even if today the owners are American, we have all seen this can change in hours. Companies are bought and sold every day. So, every group I have been a part of quickly abandons the pure ownership outlook, even though this is our traditional viewpoint.

Control: Semitec finally resolved the issue to mean, "The majority of board members must hold USA passports." Interesting! Clearly a narrowed definition. Presumably this gives majority control to interested loyal citizens. This is clearly a workable criterion. However broader interests have been raised.

Infrastructure impact (local value added): National Semiconductor first proposed this idea in 1988. I have given it a title. The goal is to improve the quality of life and the supporting infrastructure. So "American" companies will be, by National's proposal, companies that provide in the USA, skilled design jobs, skilled manufacturing jobs, and local purchases of goods and services. The local purchases idea is important in many materials intensive businesses, like chips and displays. As National Semiconductor said, "It is damn hard to get your chip designed into a Toyota in Nagoya when the designers and buyers are all Japanese and live in Nagoya." Presumably this idea would be measured by local content or value added tests. My layman's impression is that this is Europe's main focus.

Jobs: This is really a simpler view of the above idea. Organized labor embraces this "test" of what is "American". If American jobs are provided, especially organized jobs, that is what is desired. By this test Philips and Thomson are more American than Zenith, because they have larger installations in the USA, and bring more jobs to the US. This is a valid viewpoint, but I prefer the more complex idea described above. The broader "value added" idea brings to our shores more control of our technical destiny and more of the parts content. If the simple jobs test is applied, we wind up with "screwdriver" factories, the fast food restaurants of manufacturing, and no serious skills or technology.

Many industries are highly automated today. Their direct jobs content is small. However purchases of materials and equipment are significant. We need to capture our share of both. For these reasons I feel this viewpoint is too narrow.

Defense Availability: On the Defense Science Board, we have come to still another view. For defense, we believe it is essential to have within our shores the knowledge base (R&D), the tools (factories) and the skilled labor needed to build and improve upon essential defense parts and systems. Availability of these items within the 50 states is considered essential. So this idea includes the Jobs and the Infrastructure Impact ideas; actual ownership is viewed as less critical. "Possession is 9/10th's of the law," is the old saying. Clearly Europe and Japan practice this idea in their defense strategies.

Often the element of technical surprise has been the key to a successful defense or offense. If our key military technologies, especially computers and communications networks, come from overseas, there will be no surprises left. Others will know exactly what we can and cannot do. Others will have undue leverage over our policies and actions. We can live with an interdependent world, but we should not move to a position of near total dependence. Our trading partners do not want this either. They know a strong America is essential to the world peace and trading system we all enjoy.

Suggested priorities

For "single use" defense items, the Defense Availability viewpoint is the most useful. Having the skills, tools and people needed to supply the defense forces with critical items is clearly the key test. Control and Ownership, while desirable, can be compromised if necessary, and alone do not provide the needed support within the 50 states in case of an emergency.

For "dual use" items, the Infrastructure Impact (local value added) idea is the most useful. How much we keep in the USA will be determined by how persistent we are as a nation, and by market forces. We cannot dominate all sectors. However, as I testified, it is a major mistake to sit on the sidelines as spectators while other nations choose the best "pies" and take slices of high value added sectors for themselves. Competition is now among nations, at least in the sectors viewed as offering the most potential for the "good life" in the next century.

States provide a model for the nation

States for many years have found it necessary to take an active part in bringing "good jobs" to their territories. Corporations long ago moved beyond their borders. The change did not eliminate the need for States to be involved. The nature of their involvement changed, that is all. I am told over 30 States have trade missions in Japan. Your own Senate committee has 5 former governors. Why none are Republican, I am curious. Still, I am sure you communicate across the aisle.

I believe the USA, as a nation, must now adopt some of the same roles. We must, as a nation, set up a process to determine what industrial sectors will be most important for our citizens. Then we must go out and help attract and foster these businesses. R&D support, factory investment support, skilled workers, quality work attitudes and easy access to international markets are some of the levers at our disposal. Choosing national programs, like Senator Gore's data highways project, will help focus and motivate individuals, investors and entrepreneurs. The 89 respondents to DARPA's meager $10,000,000 demonstrate how eager citizens and industry are to see some leadership and get on with this job. In fact, leadership may be more important than money.

I am enclosing an original copy of the Business Week article I referred to. You can see from the statistics they present, that the USA is not alone in facing this problem. Europe 1992 is causing similar changes in Europe's infrastructure. We should learn to watch their responses more systematically.

Summary

The contradiction is apparent, not real. We invest in these "stateless" companies to improve the future for our citizens and to preserve key capabilities within our borders. Clearly local availability and value added are the priorities, not simple ownership or control. Ownership and control are desirable, but not the essential elements to preserve where we must choose. The States' industrial programs provide a very useful paradigm for our national effort. We must compete with nations as a nation. The time is upon us now, whether we like it or not. I hope you can help. I hope my comments help. Please let me know if you want further comment.

Sincerely,

G. L. Resor III
President

The CHAIRMAN. Thank you, Mr. Resor. You both have answered the questions that we have submitted for the committee. And you are in tremendous agreement and in very stimulating disagreement about the actual animus or environment, real commitment and dedication, Dr. Bromley, of the Administration itself.

I am convinced, if you and I were working as a team, fine, we could do it. But I am wondering how you can specifically say that we are not losing leadership in a broad range of technologies, when only two days ago we got a report from the Secretary of Commerce studying 12 emerging technologies, with a U.S. market potential of $350 billion in sales by the year 2000 and a world market of $1 trillion, which says we are losing out.

You say we are not losing, and then Commerce gives the Administration a report card which says that we are behind. To put the question in focus: against Japan we are behind in advanced materials, in advanced semiconductor devices, digital imaging technology, high density data storage, optoelectronics; and losing badly on the report card for advanced materials in biotechnology, digital imaging technology, superconductors. We are also losing against Japan in advance semiconductor devices, high-density data storage, high performance computing, medical devices and diagnostics, optoelectronics, and sensor technologies.

So you see, I have an eerie feeling, as a politician, that the Department of Commerce is more nearly correct. You only mentioned chemicals, but the Japanese never have targeted the chemical industry. They are targeting these industries. And they have got their government in behind it.

What is your comment?

Dr. BROMLEY. I would have two general comments, Mr. Chairman. First of all, I think it is important for us to keep in mind that we have consistently produced more leading-edge technologies and breakthroughs in technology than has Japan. There is no doubt about that. Almost every important technology was invented in this country.

Our problem is that (a) we have been unable to keep the technology to ourselves; and (b) we have underinvested in production capacity to exploit that technology. Japan, I believe, has been successful primarily because it understands very clearly where its advantages and strengths are.

In my view, they are first in the ability to focus on incremental improvements. We, sir, I believe, pay a heavy price for our focus in this country on evolutionary discoveries. Our reward structure is based on the Nobel Prize discovery, and we do not pay anything like adequate attention to the evolutionary technological changes that allow a manufacturer to get the product out the door a little cheaper, a little quicker, a little more reliably. The Japanese are marvels at that. And they are beating us consistently in that area.

I think we have to change our reward structure.

The CHAIRMAN. I wonder about that, Dr. Bromley. For example there is Motorola. They are changing their cellular telephone, and they not only change it every year with each year's model, but the actual manufacturing equipment changes every three years, and all of it is incremental. And we have other Motorolas in this land.

Dr. BROMLEY. I agree, sir, that the second great advantage the Japanese have is their ability to out-invest us in production capability, and in particular, to amortize production equipment so that they can move from technology to technology very rapidly. Frankly, it seems to me, sir, that a successful strategy on our part must first of all continue to focus on our ability to innovate. That is our edge.

And second, to protect what we invent.

And third, to put much more emphasis on investment into our production facilities.

And I would like to conclude this comment, Mr. Chairman, by just suggesting that we are getting a grossly inadequate return, in my view, on our research and development investments. Doing more of the same that we are doing now in supporting technology is not going to solve our problem.

In fact, I would submit to you, sir, that my colleague here, Mr. Resor, provides a good example of one of our problems. His company sells manufacturing equipment for flat panel displays to Japan. We sell Japan frontier technology and they sell us back products. The return to us is grossly inadequate. This, I think, is one of our major areas of difficulty that we have to work on.

The CHAIRMAN. Well, the commercialization of our technology and research has been lagging, and I am pleased to hear your strong support of the advanced technology section of the National Institute of Standards and Technology regional centers. But the record would show of course that rather than continuing to fund and have another three successful centers—and all three of the now existing centers in Cleveland, Rensselaer and South Carolina have been very successful.

We have a list of a dozen others which would qualify, but we did not put the money there. I had to literally beg Darman and everybody else because you had red-lined the Advanced Technology Program in NIST, and I had to just sneak in and beg that they do not knock out the $10 million for the existing centers.

Now at the congressional level we are saying, wait a minute here, we have only $200 million in the National Institute of Standards and Technology, or the civilian side, and we have $40 billion over here in defense. We would think that a President, with the change in Europe, and moving now from the Cold War to the Trade War, would say look, we are going to reverse this thing. And we are going to do it in a systematic fashion over the next three years. The EEC is not combining for 1992 to promote free trade.

Senator Bentsen, a committee member and Chairman of our finance committee, has looked at the requirements and everything else like that the EC will be implementing. Production requirements are being written right into their procedures in Brussels, and we know it.

And we do not even have a Department of Commerce fellow over there to represent us. And we are not doing anything about it. Soon they are going to be leading and taking over and everything else, and we are just hanging back without a studied plan of really helping in what you are now criticizing.

It is not the lack of intellect or ability or talent, it is a lack of government right here in Washington.

Dr. BROMLEY. Mr. Chairman, my staff and I, working with Commerce, Defense, and other parts of the Administration, are in the process of trying to develop, right at this moment, a technology policy. It is undergoing review throughout the government, and we agree with you that there is a very real need for a coherent, integrated policy in this area.

The CHAIRMAN. Do you have a comment, Mr. Resor?

Mr. RESOR. I would like to comment on the idea of technology protection. In the long run there is no way to bottle up an idea. It is clearly in the best interest of defense from time to time to control the dissemination of technology. And it is a delicate balance.

Maybe I should just confine my comments to the world I know best right now, MRS. If the government decided that the technology we have created to create large flat displays should be sold only in the United States, there are almost no customers. I could sell only one or two units. The failure goes back earlier in time somewhere. We have not created the industry.

I have two very strong competitors in Japan, Nikon and Canon. Nikon is an over $1 billion company and Canon is over $4 billion. They understand the basic technology. They can do what I have done. They cannot do it as quickly. One of the things that is missed in this discussion of protecting technology is the fragility of the position that a company can create.

We are always hustling to stay a year or two ahead of the comparable technology group in another country. Monday I was at hearing that Senator Kerry, a member of this committee, held in Boston at a small sonar technology company, a division of General Instruments in the Boston area. The Navy loved their product so much that they basically killed the company. It was not intentional, it was just the cumulative result of technology protection actions.

The company we were visiting invented the sonar equivalent of the first aerial camera and provided the technology for the Navy to photograph the bottom of the ocean. It was clearly a very important technology and I do not quibble with the Navy's actions to control its dissemination. But eventually other companies in Europe learned the technology and are now the dominant competitors.

So there is a real problem in timing on technology protection. And I think a better policy in, as you have dubbed it, the Trade War, is to be proactive not reactive. Do not protect, but create the advantage first. That is what we have to do in business.

The best example in the display business is the FAA procurement of the very large screens for the new network. If that mission had been made clear early enough and if there had been a mission of creating advanced displays and a program put in place, the technology in this country could have been organized. But there is not that vision. Everybody wants to go down and buy it off the shelf.

Even the Defense Department now has a—I do not know who the big distributor of consumer goods is here in Washington, but in Boston it is Leachmer Sales—and if I have the urge tonight I run down and buy it. And that is how we seem to run our technology program, as well as everything else.

So I think it is a tricky issue and it is a mistake to think that we can bottle up ideas for very long.

The CHAIRMAN. Very good. We are very indebted to both of you gentlemen. And just stay right there if you do not mind. We have heard the last bell for a roll call, and both Senator Gore and Senator Danforth will be returning. We will be at ease for just a moment.

[Recess.]

Senator GORE. Ladies and gentlemen, if the hearing would come back to order, Chairman Hollings asked me to reconvene our session while he is voting and he is expected to return shortly.

Dr. Bromley, in discussing the commitment which the Administration is prepared to make to assist in the development of targeted technologies, you included high definition display technology. Let us review that briefly. It is my understanding that approximately $10 million is now committed to that technology, that the Congress put in an additional $20 million, but required a report from the Administration on its high definition technology policy before those additional funds can be released.

It is my further understanding that in spite of the fact that a good deal of time has passed, in spite of the fact that the report I just mentioned is required as a pre-condition for the release of the additional $20 million, the report has still not been forthcoming.

Am I correct in my statement of the facts?

Dr. BROMLEY. You are correct that the report has not been forthcoming. I would, however, have different numbers, sir, for the investment.

Senator GORE. All right. Tell me what your numbers are.

Dr. BROMLEY. I specifically have the fiscal year 1991 budget request numbers. It proposes $118 million for advanced imaging technologies.

Senator GORE. We are talking about appropriated sums in the current budget year.

Dr. BROMLEY. I do not have that number with me, sir, but it is $118 million in the 1991 budget.

Senator GORE. All right. In the current budget year the numbers are ten and 20 respectively—ten for—that is, requested, and has been appropriated. An additional 20 which the Congress appropriated conditioned upon the delivery of this report on what the policy is, and that has not been forthcoming. I will get to the fiscal year 1991 requests in a moment. But where is the report?

Dr. BROMLEY. Well, right at this moment, sir, my staff, working with other Departments—Commerce and Defense—are attempting to evaluate the various issues that are raised in this request. It is not an easy area to answer. As the congressional budget report itself stated, and I quote, "Even the optimistic forecasts for the HDTV market are small, relative to the other electronics markets, and thus it is unlikely that HDTV will, by itself, revitalize the U.S. electronics sector. These conclusions do not necessarily mean that Federal support for HDTV development is without merit," and so on.

So why you do not have the report from my office, sir, at this time, is because we are still trying to come up with an appropriate answer to the four questions that were proposed. I do, however,

want to make some comments, if I may, at this time, although we are not ready, yet, to give you that report.

The first observation is that I think that it is improper for the Federal Government to develop specific commercial products, but it is quite proper for us to support research to develop precompetitive generic technologies. I think we have here an excellent example. HDTV, rather than being a generic technology in itself, is a rather limited example of the exploitation of at least three areas of generic technology.

One is the area in which Mr. Resor is the expert—that is, high resolution imaging technology. The HDTV system that people are discussing is not really distinguishable from a high end computer work station. So one technology is the imaging technology. The second is the hardware inside, the specific applications—specific integrated circuits that are part of that system. Third is the software that drives the whole system.

So those are components that have enormous implications in telecommunications, in the computer field, in applications of a very broad range and nature. HDTV is only a very simple example of the utilization of those. The question, I would submit, is that our focus is somewhat misplaced if we focus only on the HDTV aspect of it. I just wanted to mention that, and go back, first of all, and recount that in the 1991 budget submission, sir, we propose $118 million for advanced imaging technologies, $537 million for semiconductor research, and $469 million to support a high performance computing initiative. All these programs will contribute to support for the technologies that underlie HDTV that I have just mentioned.

In addition, the Department of Commerce NIST program for an integrated services digital network, the ISDN, will assist in developing industry-wide standards that will allow different products in this and related industries to interface adequately with one another.

The Defense Department today is not supporting HDTV per se, as you know, but is sponsoring research on the underlying generic technologies. I would submit to you, sir, that that is the appropriate course of action.

Where possible, components will be compatible with emerging commercial HDTV standards, and these components will be central to many military systems. The DOD would like to enjoy the economies of scale that would be available if these components also had commercial applications.

But a number of issues in this area are contributing to the difficulty that we have in coming to concrete conclusions relating to the effect HDTV would have on U.S. industry. I could continue at considerable length on this, sir, but just to mention a few of these things: I feel that high resolution imaging technology may be one of the very important aspects of improved education technology in this country. We have a system whose technology has not changed substantially since the 1800s, and as we have discussed in previous hearings, sir, the fact that one can now produce material for students in visual form so that the unique ability that the human mind has of grasping material, of understanding material in that form, can be implemented, leads me to believe that these technol-

ogies have applications far beyond those that we have considered at the moment, far beyond HDTV as such. They are and will be important areas where Government support will be needed and will continue.

Senator GORE. Well, I appreciate that response and I appreciate your efforts, and I understand with some sympathy how difficult it must be to reach a consensus within this Administration on what the policy ought to be, but with all due respect I do not see why this particular report should be all that difficult.

The $20 million is for generic technology R&D. The President said in his March 7 speech this year that he supports this kind of research. The DARPA focus is on technology for displays. It is not for consumer television sets. Yes, it will have commercial applications. That is one of the reasons it is a targeted technology. But with all those components in place, including the President's speech, it should not be that difficult to write that report.

Now, I do not have to work with Michael Boskin and I do not have to deal with the other participants in this debate——

Dr. BROMLEY. May I comment, sir? I agree that it should not be all that difficult, if the question were in fact posed as you posed it. If we were talking simply about the appropriateness of supporting the development of the generic technologies, imaging technology, the semiconductor integrated circuit technology, the software aspects and so on, I would not be sitting here telling you that we could not get the report to you.

The problem is that we started the discussion of this whole area, I believe, from the wrong point, and the focus was on HDTV rather than on the generic technologies that underlie it. That fact is what clouds the discussion and raises all sorts of issues that are making it extremely difficult to arrive at a consensus.

Senator GORE. Well, I look forward to pursuing this in the next round, but I feel as if I have taken more than an appropriate period at this point, and I am particularly looking forward to asking questions of you, Mr. Resor. I really enjoyed your statement. I thought it was very hard-hitting, and for further comments on same I will now recognize Senator Danforth.

Senator DANFORTH. No. I think you put your reaction very clearly, Mr. Chairman.

Dr. Bromley, I found the most fascinating part of your testimony, and I want to congratulate both of you on your contribution this morning, right at the top of page 7 of the prepared testimony which you submitted, and I just wanted to read two or three sentences:

"This Administration believes the Government must make R&D activities at federally-supported laboratories more relevant and accessible to the private sector, and that such efforts should be guided by the potential users. The Government has a relatively poor track record where it has invested in civilian technology without close involvement at the outset from potential users. If industry does not perceive the need or is not interested in co-investing in research, there is little point in the Government's engaging in technology push."

I think that that is interesting, and I want to just focus your attention on those sentences and on the following observation. Gov-

ernment is, as you have pointed out, involved in paying for an awful lot of research, and Mr. Resor wants Government to be even more involved, and I think that that is fine. My question is, how do we decide what Government does or does not get involved in?

I am not one who believes that there is some special genius that resides in Washington. There are a lot of smart people, but I do not think that there is something, say, in the water supply that transforms people in Washington into just absolute wizards as to the course that the country should be on, and if the decision on—the pejorative term would be industrial policy—is made by us, you know, as able as some of us are in Congress, I am going to tell you what we would target. The absolute targeted industries: autos, steel, textiles, leather, sugar—that is what we would be targeting.

For example, where we make the decision as to where research money is spent is very largely determined by the State in which a particular university resides and whether that State is represented on the Senate Appropriations Committee. That is how we make decisions. So, I mean, if the genius is supposed to be here, here is where we are going—we are not going to target the futuristic industries. We are going to target those with a lot of voters, and that are in trouble. Those are going to be the dying industries.

The political difficulties of what you have proposed by way of tax policy and what Mr. Resor has endorsed are obvious, because they are in the paper every day. I mean, if the scientific community, the R&D community in this country, were to come up with a tax policy which says all right, let us restore the capital gains differential, do away with the double taxation on interest and dividends—there are a couple of components, such as making the R&D credit permanent, which I think are less controversial, but—immediately the reaction would be, oh well, that is a rip-off for the rich. We cannot do that.

So the politics are often driving us in exactly the opposite direction from everything that the two of you have been talking about, and my question to you is, if Government is going to get more involved, what is the system for making those decisions? How are those decisions made? I am very interested in the sentences that I have read. Namely, that if there is some relationship between the users, if somehow the people out there in the country can drive the decisions, we are going to be better off.

Dr. BROMLEY. Well, if I may, Senator, first of all, I could not agree more with what you have said. I, too, have not found the magic spring locally, but the fact is that we already have made it clear in this Administration that we do not believe that we are as competent as the people outside the beltway to make many of the important decisions. For example, it is for that reason that the President has brought together his Council of Advisors on Science and Technology, a distinguished group of private sector individuals that come in monthly to discuss directly with him this sort of issue and that can work with us to make sure that we have a private sector input into the policy decisions being made at the highest levels of Government.

I think that has been a weakness in the past. We have tried, as I have indicated in earlier testimony, to structure first of all the Federal Coordinating Council to handle the areas of research and de-

velopment—a Federal Coordinating Council that now has membership at the Cabinet level—so that we can make policy decisions that will stick in terms of implementing decisions. But we have been very much concerned that we not make decisions to help someone out there who does not really know or care about what we are up to. We think it is terribly important for us to get input from the potential user, so we are doing that at the Washington level.

At the national laboratory level, we have encouraged the lab directors and the organizations in those laboratories to do two things. One is to bring together on a local basis a private sector advisory group that discusses with them and with their senior researchers what sorts of things would be of greatest interest to potential users. And, perhaps most important of all, we are establishing in many of the 726 national laboratories that we have in this country specific offices reporting directly to the lab director, whose only function is to provide a communication link between the person who picks up the phone and calls laboratory X and says look, I need help in something or other, or I am interested in something or other—making the connection between that individual and the researcher or the group in the laboratory that really can respond.

Because the problem in so many cases in the past has simply been that particularly small businessmen did not have the time, the resources, the energy, or the know-how to thread their way through the often Byzantine maze required to really get into Federal laboratories—or, may I say, into major research universities—to really get access to what is going on and to have an influence on what is going on.

So I am completely in accord with this. We are working on this as an active part of our effort to make the research that is being funded by you gentlemen, and through you by the taxpayer, accessible and available in the arena of competitive products and services.

Senator DANFORTH. Mr. Resor, would you like to——

Mr. RESOR. Yes. The political problem you mention is exactly why I have been an opponent of industrial policy up until recently. If the Federal Government had dictated technical policy in lithography, we would be all making very expensive computers with E beam technology. One of my missions was to convince the world that optics technology could go sub-micron, and we did it. But Nikon enjoys the benefits. In fact, it may come as a shock, but we have wondered about the water in Washington also, but it was a dullness of spirit, not genius, that we have noticed. I think it is a very real problem.

It seems to me one of the—well, two of the geniuses of the Japanese system are they seem to have avoided the political problems you mentioned. I think we should study that, not just speculate about it. Maybe a group should be funded and set up to understand how other economies avoid that political problem. Because they have the same risk. They also seem to have avoided the sort of European-American problem of setting up monopolies, and again I think we need to study how they did that. I have tried to discern the answers to those two questions, and I have not been able to figure it out. So it is a very real concern.

I think the landscape is not as dismal as you painted it. We do have some paradigms, we were talking about it on the break. Agriculture, NIH and DOD have targeted segments. They have users, as Allan has said, and I think they have a success record because of that linkage. As a businessman, I need that linkage.

Maybe an idea is to find a way to build that linkage in some other aspects of the bureaucracy. I think the Congress' focus needs to be on the process, not the end results. If you focused on how to set up these mechanisms so they are successful and include a broad spectrum of visionaries and reactionaries, I think the process will work out. It is a complex economy. There is no simple answer.

Senator DANFORTH. I really agree that we should be talking about process, exactly, and the larger policies that put us in a better position as a country for the future. The political reality is that all of these individual constituencies are leaning on us for one thing or another, which may have nothing to do with the long-term future of the country. A university in a State, which does not even have a department of XYZ, might want a new lab to attract some people to set up an XYZ department, so it gets a grant. It does not do it through any competitive process. It does it through the Appropriations Committee, and there are very strong feelings about that.

I am concerned that whatever we do, we tend to blow it because of extraneous concerns. They are very important extraneous concerns to our constituents, but they are certainly extraneous to the scientific future of the United States.

One thought that I have is that sooner or later we are going to have a tax bill. Late this year, maybe next year, and I would think that if you were to get together the high tech constituency, the university constituency, there would be a handful of other things that could be done. I mean, it is not, you know, the "A" list that you have, Mr. Resor, it is the "B" list, but I really think that there are some things that we could do in tax legislation.

Maybe we will not get a capital gains differential. I hope we do. Maybe we will not deal with the so-called integration question, the double taxation of dividends. It would be tough, politically, to do it, but clearly it would be advantageous, I think. We can make the R&D credit permanent, and we can deal with some problems that are peculiar to our finest universities. The cap for the tax-exempt bonds is an example, the inclusion of the gifts of appreciated property under the alternative minimum tax, both of which issues your former president has been so keenly involved in.

Senator McCain, it is wonderful, you know, this—I hope that this is not just a blast from the past, presiding over the Committee.

That it is sort of a little preview of things to come. [Laughter.]

Senator MCCAIN. Well, I certainly enjoyed the lecture, Mr. Chairman. And I am frankly in agreement with most everything you have said. And I wonder if the witnesses have a response or an affirmation of what Senator Danforth has said? Or do you have any disagreement with—I know he covered a fairly broad spectrum there, but I think they are all very important items that he addressed.

Dr. BROMLEY. I would have no argument whatever with the Senator.

Senator MCCAIN. Mr. Resor.

Mr. RESOR. I am active in the AEA and SEMI, and we have been lobbying these specific focused items on the cost of investment, I think, is the way to look at it. And it is a sort of menu of things. One political compromise I would put on the table regarding the cost of capital is we also need patient capital. It used to be, I think, corporate money; somehow we have lost that.

If the capital gains incentive were applied only to really long-term holdings, and a penalty was applied to short- term holdings, and you can negotiate with your political constituency where to draw the lines, then, I think you can make it revenue-neutral. And it would seem to me to largely offset the benefit-to-rich argument and fix a structural problem in our money markets.

Dr. BROMLEY. If I may, Senator, I think there are two constituency problems that we need to address jointly. The first is that a very large fraction of our population remains completely unaware of the fact that we have any problems concerning competitiveness in technology and in any of these areas. I think that it is going to be very important for the Administration, working with you and the Congress, to raise the public consciousness about the importance of this issue. It simply has not come on their screens at all in most instances.

The second thing is that the science, technology, and engineering community is woefully incompetent when it comes to putting together a political constituency along the lines that you were discussing earlier. I think that it is cultural change that will eventually be forced on them, but it is going to take some time.

There is an arrogance in the community—and I can speak from forty years as a member of that community—that results in the feeling that sooner or later someone in Washington will realize that what I want to do is so important that they will come up with the necessary support. It is there, it is ridiculous, and it is hurting us all. I think we all have to work on correcting that.

Senator MCCAIN. Dr. Bromley, I agree with the second part of your statement. But I would tell you that from my perspective, in the State of Arizona there is enormous concern out there about this competitiveness issue. Now, perhaps, it has not been focused correctly, but one of the most educational and humbling experiences I have as a politician is holding town hall meetings. And always one of first three questions concerns the Japanese, one of the first three will always be on that issue.

Now, perhaps, as I said, it is not focused correctly, but there is enormous concern out there about where the United States is in the world competitively. And I think it has penetrated the consciousness of Americans to a great degree. Now, whether they are aware of this checklist—which I think is excellent, by the way, on page 2 of your statement—those dots—is probably a job we have to do. But I do not think you should underestimate the amount of concern that exists out there about where the United States is competitively, as particularly the focus on Japanese, but it is also widespread.

Also, I noticed on page 3 of your statement, you also said that a high priority of the Administration is product liability reform. It is also mine. But I can tell you that the forces of the American Trial Lawyers Association has been marshalled against that to an in-

credible degree. It is amazing the visceral and emotional and bitter——

Senator DANFORTH. And economic.

Senator MCCAIN. Yes, yes, economic. And I have focused a lot of my attention, along with Senator Nancy Kassebaum, on aircraft product liability reform. We have taken two tracks. We have reported a product liability reform bill out of this Committee just this week. Also, we have been working on aircraft product liability reform.

And, frankly, it is amazing to me that the American Trial Lawyers Association refused to even come to the table. They refused to even discuss the issue, which is incredible to me, because every other interest group that we deal with, that I have dealt with here on the Hill, is at least willing to sit down and talk. But on that issue there is really no willingness whatsoever.

And perhaps that is bred from a confidence that they believe that they can block legislation, which I am afraid is probably the truth, it is probably the case.

Let me ask you a couple of specific questions. First, earmarking of funds for universities. That seems to have been a small disease that has now spread to an enormous degree. Are you concerned about that?

Dr. BROMLEY. I am extraordinarily concerned about that, sir, because I can think of no mechanism that is more surely guaranteed to destroy the science and technology enterprise and the research enterprise that we have built over the past century or so.

Senator MCCAIN. But how do you respond then—and frankly I am in agreement with you that it is a serious problem—how do you respond to the charge that somebody from Arizona says, wait a minute, if I leave it all up to you, Dr. Bromley, and people like you, who are probably all Harvard or Ivy League graduates, all the money goes to Ivy League schools; and the rich get richer, and the poor get poorer. How do you respond to that?

Dr. BROMLEY. I would respond to it in two ways.

First of all, I think that we have been victimized a bit by a myth that has existed since World War II, that we in the Federal Government do not support higher education. Of course we do, because innumerable graduate students have been supported under the table through research grants and contracts. But I think it is important to realize that these two aspects, education and research, have to be looked at more discretely than they have been in the past, otherwise we are going to run into some very serious problems. Let me, if I may, just check them off.

First of all, a statistic that I find compelling is that over 75 percent of American youngsters go to college within 50 miles of the place they were born. That to me implies that we have a real responsibility to provide high quality educational opportunities across the nation.

On the other hand, the thing that has been central to the federal support of academic research—the model that was put together by Mannie Piose and Bob Conrad just after the war and is the envy of the world—was based on one thing only, and that was excellence. You found excellence wherever it was and you supported it.

Nothing could be worse than supporting lousy research somewhere in the hope that it would help education and perhaps help economic development. So, I think to say that we should distribute our research support to get a geographic educational distribution would not be a productive way to proceed. We have to recognize that there will be some concentration of research support because excellence attracts excellence. But we cannot allow that to be a static situation.

We also have an obligation to help states and universities that want to get into the first rank to do so. There are programs—EPSCoR is one example—that are under way; they are highly leveraged programs that really get a lot for the federal dollar that are working in that direction.

Senator McCain. First of all, as I say again, I agree with you. I think this earmarking thing is a disease which has grown from a very small amoeba to one which may be consuming the entire body of the appropriation. But let me say that, even though I am in agreement with you, how in the world can you make an argument that some of those funds are equally distributed when statistics year after year indicate that the overwhelming majority of that money goes to the same institutions?

And we want to encourage—I think we have an obligation—to try to encourage excellence throughout the nation, rather than just at Stanford, Harvard, Yale, MIT, et cetera. And that has not, apparently, been implemented.

Dr. Bromley. We have, sir, as I mentioned, the EPSCoR program, where the National Science Foundation uses the funding available to it to leverage state and local support for the development of research activities in universities that do not have strong research activity, hopefully, to bring them up to the level where they can compete in any competition we care to name with anybody else in the country. I think that that technique of broadening the base of excellence for research is critically important. But I think it would be a gross mistake to support research, for the reasons you say, on other bases than excellence, because it will not have any of the effects. It will not produce good results; it will not produce good education; and it will not produce industrial development. It will simply be a sink for funds.

The bottom line, as I see it, sir, is that we in this country—despite the fact that we are proposing $71 billion plus for research and development in the 1991 budget—in my opinion are seriously underinvesting in our science and technology base as part of our national future. Given what EC 1992 has in mind, given what the Japanese have in mind, we simply are underinvesting.

If we can correct that underinvestment, then I think that one of the areas that deserves strong targeting in the right sense is the development of a much broader spectrum of excellent research activities at universities across the nation. Because we in the developed world are absolutely unique in the demands we make on our research universities; we ask them not only for new knowledge, but also for the young minds trained to use that knowledge. In other countries those are separated.

Senator McCain. Thank you, Doctor, but—and just as a word of advice, you will have to convince Congress that not only are you

rewarding excellence, but you are providing impetus for the attainment of excellence in colleges and universities. And, frankly, that is not the perception today. That has to be changed.

I appreciate the indulgence of the Chairman. Let me just mention one other thing, one other issue, very quickly, a very brief question. I am the Co-Chairman of the Advanced Materials Caucus. I think advanced materials technology is critical to the future of this country. What is the Administration doing to speed the commercialization of this critical technology? And do you agree that it is a critical and, indeed, crucial technology?

Dr. BROMLEY. I think that materials science and technology are one of the orphans of the Washington scene, because they do not fit neatly in a given agency, and they do not fit neatly in a given university department. So I feel we have a major responsibility to look into that.

We are putting together—first of all, the National Critical Materials Council has been reactivated; I am now its chairman. We also have a committee under the Federal Coordinating Council trying to pull together the scattered activities in this area throughout the Federal Government.

We are putting together a panel under the President's Council to get the private sector input that we need to make sensible policies in this area. It is an area that my office views as one of great importance and one where we have to try to integrate federal efforts much more effectively than is now the case.

I can quote you one number that I think is impressive. Oak Ridge recently demonstrated, after a study of American industry, that the efficiency of the average U.S. industry is limited in almost every case by the behavior of materials, usually at high temperature. And they went further and demonstrated that for every degree fahrenheit that you could raise the temperature of the average industrial process in the U.S., you will get an economic payback of $2 billion. That is an impressive payback. And it, I think, just emphasizes the importance of the area you have mentioned.

Senator MCCAIN. Thank you. That is very gratifying. I have several questions I would like to submit for the record, Mr. Chairman, and I thank you. And I thank you, Dr. Bromley, and, Mr. Resor, for some very impressive testimony this morning. Thank you, Mr. Chairman.

Senator GORE. Other members of the Committee have also indicated a desire to submit questions for the record, and I hope you will be willing to respond for the record. It seems that Senator Hollings has been inadvertently delayed. As you may know, there are a number of negotiations under way on fiscal policy right now and other matters. He asked me to express his regrets that he could not finish out the rest of the hearing. I have only a few more questions, and then, we will conclude.

First, Dr. Bromley, you said in your opening statement, with some pride, that we have invented many more things than the Japanese, and that most all of the significant developments have occurred first here. I wonder if you believe that is still going on? Do you think that is still the case today?

Dr. BROMLEY. In terms of breakthrough innovations, the ones that change the paradigms, yes, definitely so. But in terms of the

smaller developments, the evolutionary ones that can improve productivity, that can improve manufacturing, the answer is definitely no.

Senator GORE. I am wondering if that trend has not already extended into basic invention? A lot of brand new discoveries now seem to appear first in Japan compared to the United States. You are an authority in this area. But how do you explain, for example, the dramatic change in the percentage of U.S. patents going to inventors from other nations rather than inventors from the United States?

Dr. BROMLEY. There are probably several parts to the answer, Mr. Chairman. The first is that I think in a great many cases—particularly, in the biotechnology industry, for example—the U.S. position is now that patents are not nearly as important as they used to be, so a great many things that might have been patented by our people in the past are simply not patented now. One just forges on and tries to do the best one can without them. On the other hand, a great many people abroad recognize that it is the American market that is the one that they really want to focus on. So there is a premium attached to having a U.S. patent.

Third, you are absolutely correct that country after country is recognizing that whereas they could look to us in the past to keep the reservoirs of basic research results filled adequately for their purposes and ours, they are now beginning to feel that perhaps we are going to let down our end of the informal bargain, and that they are going to have to put much more of their resources into basic research and into the development of basic technologies; they are doing it. There is no question about it.

It should not surprise us in a way, because it is a natural evolution from our position in the immediate postwar period, when we had unquestioned superiority, essentially across the board. I think all of those things contribute to the fact that we are getting many more foreign patents.

But I would go back to your first question, Senator. I do not believe, to the best of my knowledge at least, that the Japanese have anywhere near caught up to us in terms of what I would characterize as the breakthrough developments in either technology or basic understanding. But they certainly have, and they are way ahead of us, in the evolutionary ones.

Senator GORE. Mr. Resor, what is your perspective on this point with regard to the breakthroughs, paradigm shifting, advances in knowledge that are directly relevant to the field of inquiry that underlies your business?

Mr. RESOR. My experience is the same as Allen's, that we are 45 percent of the world economy and declining, and that is not our failure. That is other nation's success. Particularly in displays, I would say, most of the patents are improvements on the basic idea of active matrix thin film transistors. But—and I do not think Allen meant this—we have a tendency in this country to demean improvements by the way we talk about them.

A fellow named Stan Ovshinsky was considered a crackpot 20 years ago, when he said, silicon devices could be made in amorphous silicon. The solar panel industry in this country paid for the knowledge development to make that a real process. And where

the Japanese excel is in hammering out all the details that make a successful commercial process, and that is what they are patenting.

I think you are probably also familiar with their tendency to engage in what we call patent flooding. I do not think they have the same view of what we call a doctrine of equivalence. And in my view they basically register designs. And much to my dismay our Patent Office has been approving them as patents.

I have recently seen a patent where someone has invented a six-sided box. And a subsidiary claim is one side that opens, so you can retrieve the contents. That is a U.S. patent.

Dr. BROMLEY. Could be very useful.

Senator GORE. Could be useful, yes.

Mr. RESOR. I think they had them in Mesopotamia.

Senator GORE. Well, they should have patented them.

I had a hearing 13 years ago with Stan Ovshinsky and was absolutely convinced at that time that he was really on to an extremely promising line of inquiry. And, indeed, he was dismissed by many as a crackpot. I lost track of him for a long time, until I picked up a technology magazine with a feature article entitled, Japan's new wizard of amorphous semiconductors. And, indeed, he had tried, without success, to interest American companies in his breakthroughs and found in Japan a ready and willing audience. And there are so many other examples of that same thing.

Dr. Bromley, let me ask you specifically about this document that the Chairman, that Chairman Hollings, talked about earlier. Have you had a chance to look at this?

Dr. BROMLEY. Not in detail, Senator.

Senator GORE. Let me ask the staff to give you a copy.

Dr. BROMLEY. I have a copy, sir.

Senator GORE. Do you?

Dr. BROMLEY. Yes.

Senator GORE. Could you turn to page——

Dr. BROMLEY. I do not have it with me.

Senator GORE [continuing]. Page xiii.

Dr. BROMLEY. Yes.

Senator GORE. It is entitled, U.S. Report Card: Trends. This, again, has been prepared by the Technology Administration of the U.S. Department of Commerce.

I read from this at the beginning, in my opening statement. Chairman Hollings read from it in his introductory remarks. And it is to my eyes, at least, extremely troubling.

Dr. BROMLEY. I agree completely.

Senator GORE. Excuse me?

Dr. BROMLEY. I would agree completely.

Senator GORE. Yes. You do not have any reason to challenge their findings?

Dr. BROMLEY. Well, in fact, I would not agree with some of the entries here. For example, it says here that we are losing badly to the Japanese in biotechnology. I think it is very important to keep in mind what the situation is here. In biotechnology we still, by a very large margin, lead the Japanese in terms of the development of the new organisms, in terms of the basic research, no question about it. Where the Japanese are ahead of us is in scale-up processes.

It is typical of what we have been discussing all morning, that the basic discovery we still make. But the fact is that the scale-up process in biotechnology is very non-linear. Bugs behave very differently in large containers than in small. The Japanese have, quite frankly, been looking to us to make the basic discoveries, and they have been focusing their activities on what they are going to do with our discoveries once we make them. So they have put a tremendous amount of their emphasis on fermentation technology. They are ahead of us in fermentation technology. But in all the rest of biotechnology, we, in fact, have a very substantial lead. So I am afraid that, if this is typical, the document may tend to tilt the situation somewhat perhaps for emphasis.

Senator GORE. Let me refer you to the page immediately prior to the one that you have just been focusing on, because I think we may be talking about—I may be talking about apples, while you are talking about oranges. The page just prior to that one, xi——

Dr. BROMLEY. Yes.

Senator GORE [continuing]. Confirms what you have just said about biotechnology, because it describes the status of the industry in 1989 as of the time this report took a snapshot of the industry. And, indeed, it says that in biotechnology we are ahead of Japan and ahead of Europe as well. But after a detailed analysis of the trends which can be expected in the immediate future they conclude, rather surprisingly to some, that even though we are significantly ahead of Japan in biotechnology today, the trend shows that we are badly losing ground in biotechnology.

Perhaps this is a subject for another more detailed hearing. I respect your knowledge of this field immensely. And if you would have the time at some point to have your staff under your supervision look a little more closely at this chart on page xiii and give us your considered judgment as to whether and where it might be inaccurate in its depiction of these trends, that would be very helpful to the Committee.

Dr. BROMLEY. We would be happy to try to do that, sir. In this area in particular one of my associate directors, Dr. Wyngaarden, is chairing a working group on biotechnology for the Competitiveness Council. And we have a considerable amount of material already in hand.

Senator GORE. About eight or nine years ago, I authorized from the Office of Technology Assessment a study of this specific question: what needs to be done, and what is being done to assure continued U.S. leadership in biotechnology? Almost none of the recommendations made by OTA were accepted by the government at that time. Therefore, it would not be surprising to me to see that the trend is, in fact, against us in this area.

Mr. Resor, you made a statement in your opening comments which I wish to pursue a bit. You said that if one invests in the targeted industries, the industries targeted by Japan, that investors and bankers are less willing to commit capital because of a feeling that the risk of an adequate return is much greater. Did I hear you correctly?

Mr. RESOR. Yes, that is my belief.

Senator GORE. So, the problem feeds on itself. And the investment community is beginning to withdraw support or slow down

support for industries which it feels are vulnerable simply because the U.S. Government is not paying attention while the Japanese Government is?

Mr. RESOR. I would not put the finger on just the investment community, I think corporate America also. I have tried very hard to understand why the United States is not investing in digital display technology in terms of scale-up, particularly, where the technology was created here but not perfected here. It is the same story repeated again.

And I felt if I could understand some of the pathology of this problem, it might help the greater trade problem. There are four major investments in the display business, the factory being the largest investment. We have talked about capital and the cost of capital. Most of those programs deal with the investment side.

The overriding consideration as people look into this scary investment is, "will I ever get my money back?" And, if it is a targeted industry, the pattern of targeting is to bomb the prices until you capture the market-share. It is really nothing new. It was done in the last century in this country. It led to the anti-trust laws and the Wright Pattman in pricing rules.

You know, we intervened in a free market 100 years ago to set a different pattern of industrial development. I think we rightly recognized that political power would concentrate too much if we did not, so it was really a political policy. These policies are definitely impacting USA industry now.

I think when capital is important in a business and you make a big investment, it is a mistake to keep it a secret. You see people who are making large investments in digital displays, also, making it very clear how much they are investing, to try and scare off other investors. It is an intimidation strategy. And if your own government is actually helping that by getting the best deal for the consumer, then, it is very hard to get people to invest.

Senator GORE. Yes. Well, it is a very troubling set of statements.

Dr. Bromley, Mr. Resor said in his opening comments that he has had some difficulty learning exactly what our government's technology policy is. He allowed as how it might be classified. Perhaps that is the explanation.

Some earlier questions brought out a point of view that some share: that maybe the government should stay out of it because it cannot do it well. I do not want to give a cartoon image of what that view is, but some people do believe that at least.

My own view is that the government does not have to have a full-blown industrial policy, with all of its bad features and problems, in order to have a sensible science and technology policy that assists U.S. firms attempting to compete against very tough competition overseas. And that we should have a sensible technology policy. I assume you agree with that?

Dr. BROMLEY. Yes.

Senator GORE. But we do not seem to have one now. Would you agree with that?

Dr. BROMLEY. As we discussed earlier this morning, obviously in order for it to be an Administration policy it is necessary for us to reach some consensus on this. We are in the process of reaching that consensus at the moment.

My statement for the hearing this morning is a statement on behalf of the entire Administration. To that extent, it does represent, I think, a significant distance toward what one might call a technology policy. I fully anticipate that we will flesh that out, and we will get it to you in the not too distant future. It is not classified, it is simply in the process of discussion.

Senator GORE. It is a work in progress.

Dr. BROMLEY. It is a work in progress.

Senator GORE. Is it fair to say there are divisions within the Administration on what that policy ought to look like?

Dr. BROMLEY. I doubt that there is any topic on which one could not say that there were divisions.

Senator GORE. But we are in the process of arriving at a consensus.

Dr. BROMLEY. We are working toward arriving at a consensus.

Senator GORE. From 1861 to 1865 we were in the process of arriving at a consensus on slavery. I hope it does not take that long or become that conflicted.

Well, as you know and as I will say to you, Mr. Resor, I could ask questions about this for a long time. I really enjoy exploring this policy. And I do think we need one. But time constraints have impinged upon us. And if you two would be willing to answer further questions for the record that would be much appreciated. And with that the hearing will cease.

[Whereupon, at 11:55 a.m., the hearing was adjourned.]

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